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# UTAH.

A COMPLETE AND COMPREHENSIVE DESCRIPTION OF THE

## Agricultural, Stock Raising and Mineral Resources

OF THIS

From Prof. Harringt

## TERRITORY.

ALSO

STATISTICS IN REGARD TO ITS CLIMATE, ETC.,

COMPILED FROM THE LATEST REPORTS OF 1887.

PRESENTED WITH THE COMPLIMENTS OF

THE PASSENGER DEPARTMENT

OF THE

UNION
PACIFIC
THE
OVERLAND
ROUTE

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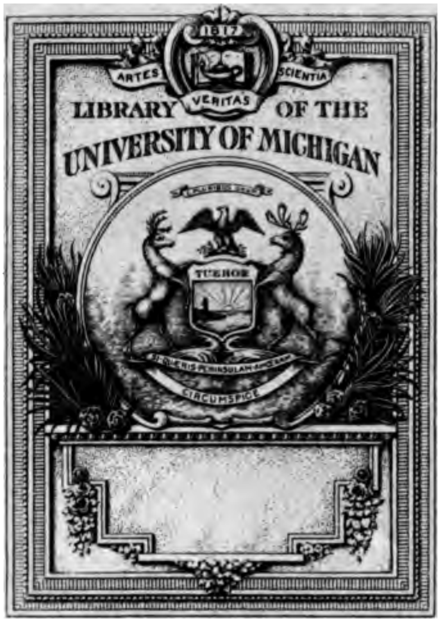
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# THE RESOURCES —AND— ATTRACTIONS —OF— UTAH.

COMPLIMENTS OF

PASSENGER DEPARTMENT

—OF THE—

UNION PACIFIC RAILWAY.

OMAHA:
1888.

# A COMPLETE AND COMPREHENSIVE DESCRIPTION
# OF THE AGRICULTURAL, STOCK-RAISING
# AND MINERAL RESOURCES
# OF THE

# TERRITORY;

ALSO STATISTICS IN REGARD TO ITS CLIMATE
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LATEST REPORTS OF
1887.

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The Passenger Department of the Union Pacific Railway is indebted to **MR. ROBT. E. STRAHORN**, of Caldwell, Idaho, for the preparation of much of the original matter contained in these pages.

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OMAHA, MAY 1ST, 1888.

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# INTRODUCTORY.

In many respects Utah is the most unique and inviting field open to the restless eastern world to-day. The wonderful gathering together in the great Salt Lake Basin of attractions in the way of climate, lakes, valleys, mountains, medicinal waters; the manifold advantages offered to hundreds of new industries; the wealth that waits in metal-ribbed hills and fertile vales—these are a few of nature's lavish gifts. It is believed that Utah is on the eve of a transfiguration. Something not unlike a "boom" is in the air. One by one those great natural divisions of the "New West" are being closed in upon by the resistless tide which has rolled westward since the birth of the world. Utah is almost the last. In fact, a mighty army has swept by, intent only on the Golden Gate, and its rear guard is now on the return march to attempt to gain a foothold in the before neglected interior region. All these strangers who are to come will find more clear days in the year than they ever saw before; they will find an atmosphere in which the very highest achievements of brawn or brain can be realized; they will find a natural sanitarium with every existing auxiliary known in nature; they will find mines as rich and varied as were ever opened to human eyes, and they will never know what a hot or a cold day, as understood in the east, is. So why should Utah not enter its new era of unexampled prosperity?

The Union Pacific Railway company wishes every patron a liberal share of all these good things in Utah. In attracting attention to the well-filled pages of this little work, it also desires to say that it is the result of much labor on the part of the very best authorities. Special acknowledgement is made to Hon. Caleb W. West, Governor of Utah, and Col. O. J. Hollister, for many years a leading citizen and writer of Salt Lake City, for the copious use of their valuable literary offerings.

# THE RESOURCES AND ATTRACTIONS OF UTAH.

## GENERAL VIEW.

Utah Territory is in the latitude of Virginia and Missouri, between the 37th and 42d parallels north, and about two-thirds of the way from St. Louis to San Francisco, between the 109th and 114th meridians west from Greenwich. Idaho Territory bounds it on the north, Colorado on the east, Arizona Territory on the South, and Nevada on the west. It has a maximnm length of 325 miles by a breadth of 300 miles. Its land area is 84,970 square miles (52,601,600 acres), water area, 2,780 square miles (1,779,200 acres). Only that which can be artificially watered is really arable. The Wasatch Mountains bisect it from north to south, dividing it into two substantially equal parts. Of the part lying east of this range and drained by the Green and Colorado rivers and their tributaries, little use has yet been made. It is mountainous, its valleys are about a mile above tide-water, it has a little arable and considerable grazing land, with a great deal of coal on the slopes of the mountains where there has not been too much erosion.

The settled parts lie mainly along the western base of the Wasatch Mountains, between them and Salt Lake and Utah Lake, in Cache, Sanpete and other valleys; wherever, indeed, a stream flashed into the sunshine from the gloom of mountain gorge, is caught and trailed in a thousand rills upon the thirsty land. Salt Lake Basin extends 200 miles, from south of Nephi to Bear River Gates. It includes Salt Lake and Utah Lake, has the general altitude of the Alleghany Mountains, and is the paradise of the farmer, the horticulturist, and the fruit-grower. Cache Valley lies to the northeast, Sanpete Valley to the southeast of Salt Lake Valley. They are noted grain-producing sections, but having colder winters and shorter seasons are not so well adapted to fruit-growing as Salt Lake Basin. The Sevier River rises in Panguitch Lake, far south, and flows northward, finally breaking out of the mountains and losing itself in the sink of Sevier Lake. Its upper course is settled, wherever tributaries enter from the mountains on either hand.

The western one-third of Utah is mountain, desert, sink, and salt lake, with few oasises of grazing or of possible arable land. In the northern part of the Territory the Wasatch is high and massive, there is great accumulation of snow in winter and the streams are correspondingly large and numerous. In the southern part, while the Range is not much lower or less in mass, it is warmer and there is little snow, smaller and fewer streams, and more desert in proportion. The isolated ranges in the Great Basin give rise to no streams of importance, and the valleys are largely desert. Many of them are underlaid, so to speak, with inexhaustible water, however, which will some day be reached by wells, and used to transform them into gardens. Nearly all of the mountains appear to be mineral-bearing, and enough water can usually be had for mining purposes.

# UTAH.

## GEOLOGY.

The greater part of the rock of the interior mountain area is a series of conformably stratified beds* reaching from the early Azoic to the late Jurassic times. In the latter these beds were raised—the Sierras, the Wasatch, and parallel ranges of the Great Basin were the consequence. In this upheaval important masses of granite broke through, accompanied by quartz, prophyries, felsite rocks and notably sientic granite with some granulite and gretsen occasionally. Then the Pacific Ocean on the west, and the ocean that filled the Mississippi Basin on the east, laid down a system of Cretaceous and Tertiary strata. These outlying shore beds, subsequently to the Miocene, were themselves raised and folded, forming the Pacific Coast range and the chains east of the Wasatch; volcanic rocks accompanying this upheaval as granite did the former one. Still later a final series of disturbances occurred, but these last had but small connection with the region under consideration.

There is a general parallelism of the mountain chains, and all the structural features of local geology, the ranges, strike of great areas of upturned strata, larger outbursts of gigantic rocks, etc., are nearly parallel with the meridian. So the precious metals arrange themselves in parallel longitudinal zones. There is a zone of quicksilver, tin, and chromic iron on the coast ranges; one of copper along the foot-hills of the Sierras; one of gold further up the Sierras--the gold veins and resultant placers extending far into Alaska; one of silver with comparatively little base metal, along the east base of the Sierras, stretching into Mexico; silver mines with complicated associations through Middle Mexico, Arizona, Middle Nevada, and Central Idaho; argentiferous galena through New Mexico, Utah, and Western Montana; and still further east, a continuous chain of gold deposits in New Mexico, Colorado, Wyoming and Montana. The Jurassic disturbance in all probability is the dating point of a large class of lodes: *a*, those wholly enclosed in the granites, and *b*, those in metamorphic beds of the series extending from the Azoic to the Jurassic. To this period may be referred the gold veins of Calfornia, those of the Humbolt mines and those of White Pine, all of class *b;* and the Reese River veins, partly *a*, and partly *b*. The Colorado lodes are somewhat unique, and in general belong to the ancient type. To the Tertiary period may be definitely assigned the mineral veins traversing the early volcanic rock; as the Comstock Lode and veins of the Owyhee District, Idaho. By far the greater number of metalliferous lodes occur in the stratified metamorphic rocks or the ancient eruptive rocks of the Jurassic upheaval; yet very important, and, perhaps, more wonderfully productive, have been those silver lodes which lie wholly in the recent volcanic formations.

## CLIMATE.

The climate of a mountainous country like Utah will vary considerably with its varying altitudes and exposures. In the lower inhabited valleys it is agreeoble and salubrious. The air is dry, elastic, transparent, and bracing. The range of temperature and amount of precipitation can be studied from the following table, which is the result of the first twelve years observation made by the Fort Douglas Garrison, on the outskirts of Salt Lake City, and the succeeding seven years by the United States Signal Service officer at Salt Lake:

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*Clarence King's Explorations 40th Parallel.

| YEARS. | TEMPERATURE. | | | | PRCP'N |
|---|---|---|---|---|---|
| | Mean. | Max. | Min. | R'ge, | Inches. |
| 1863 | 52.93 | 103 | 7 | 96 | 7.47 |
| 1864 | 52.22 | 97 | -4 | 101 | 14.92 |
| 1865 | 50.11 | 100 | 6 | 94 | 15.51 |
| 1866 | 51.87 | 94 | 9 | 85 | 22.29 |
| 1867 | 52.71 | 95 | 0 | 95 | 26.14 |
| 1868 | 50.66 | 96 | 5 | 91 | 17.25 |
| 1869 | 53.61 | 97 | 7 | 90 | 22.32 |
| 1870 | 51.66 | 96 | 4 | 92 | 20.96 |
| 1871 | 53.09 | 104 | 8 | 96 | 23.12 |
| 1872 | 50.42 | 91 | 0 | 91 | 18.12 |
| 1873 | 49.26 | 98 | -3 | 99 | 17.37 |
| 1874 | 50.18 | 97 | 8 | 89 | 19.55 |
| 1875 | 51.26 | 101 | 5 | 96 | 21.07 |
| 1876 | 50.64 | 97 | 7 | 90 | 18.31 |
| 1877 | 51.00 | 98 | 3 | 95 | 14.52 |
| 1878 | 51.29 | 97 | 5 | 92 | 17.86 |
| 1879 | 53.20 | 97 | -10 | 107 | 13.11 |
| 1880 | 54.00 | 95 | 2 | 93 | 10.94 |
| 1881 | 51.54 | 100 | 13 | 87 | 16.88 |
| Mean for Nineteen Years | 51.54 | | | | 15.72 |

In the last seven years there were two months in the winters, five in the springs, eight in the falls, and ten in the summers when the monthly range exceeded 50°, twenty-five months out of eighty-four. The extreme daily variation is greatest in summer; spring, fall, and winter following as named. An abstract of the monthly mean of diurnal variation at Fort Douglas, on the bench about 500 feet above Salt Lake, shows the mean temperature of June to September inclusive, at 2 P. M., to be 79°; at 9 P. M., 57; difference, 22°; mean per centage of sick for these months, 24.63. For the other eight months, the mean at 2 P. M. was 47°; at 9 P. M., 36°; difference, 11°; mean percentage of sick for these months, 32.63. This seems to indicate that the months of greatest diurnal variation are the healthiest months; and it is believed that they are so, generally, in Utah, unless from some local cause, as bad water, or drainage, or exposure. Those who have to swelter through many nights in a season with the thermometer between 80° and 90°, will appreciate the significance of the mean temperature of the four hottest months at Fort Douglas being but 57° at 9 P. M.

## ANNUAL AND SEASONAL MEANS.

| SEASONS. | TEMPERATURE. | | | | PRECIPITATION. | | |
|---|---|---|---|---|---|---|---|
| | Mean of Season. | Mean of the Max. Temperatures. | Mean of the Min. Temperatures. | Mean Daily Variation. | Mean Relative Humidity. | Snow and Rainfall. Inches. | Days on which Snow or Rain fell. |
| Spring | 50.2 | 60.0 | 39.5 | 20.5 | 41.9 | 6.91 | 30.5 |
| Summer | 71.4 | 85.0 | 60.5 | 24.5 | 28.5 | 1.55 | 14.0 |
| Fall | 51.7 | 61.8 | 41.7 | 21.0 | 39.8 | 4.37 | 22.0 |
| Winter | 31.9 | 39.7 | 24.9 | 15.3 | 60.9 | 4.46 | 34.0 |
| Annual | 51.8 | 61.6 | 41.6 | 20.0 | 42.8 | 17.29 | 108.5 |

The annual mean of Salt Lake City places it very near the isothermal line of 50°, which crosses nearly 15° of latitude on each continent, owing to the influences of oceans, winds and elevations, starting on Puget's Sound and passing near or through Salt Lake City, Santa Fe, Denver, Burlington, Pittsburgh, New Haven, Dublin, Brussels, Vienna, and Pekin. The summer and winter means describe the same undulations in traversing the continents, and they are more indicative of the climate in its relations to animal and vegetable life than the annual mean. The mean annual temperature of New York and Liverpool are the same, yet throughout England the heat of summer is insufficient to ripen Indian corn, while the ivy, which grows luxuriantly in England, can scarcely survive the severe winters of New York. In both the East and West Indies the mean temperature of the hottest month in the year differs very little (at Singapore 3⅛°) from that of the coldest. At Quebec, on the other hand, the difference is 60°, and at some places in Siberia, 100°. At Salt Lake City it is about 47°.

A summer mean of 73.4° may be thought high, but to the extremes of summer heat in nearly all parts of the United States the lower valleys of Utah offer no exception. The higher valleys and mountains are always at hand, however, and Great Salt Lake exercises a mollifying oceanic influence on the extremes of temperature. "Some travelers have imagined that on its shores is to be found the most unique and wonderful climate on the face of the globe, combining, as it does, the light, pure air of the neighboring snow-capped mountains with that of the briny lake itself; and it is fancied by many that at certain points one may inhale an atmosphere salty and marine, like that of the shores of the Atlantic, happily combined with a cool, fresh mountain air, like the breath of the Alps themselves. Owing to the absence of marine vegetation about the shores, however, there are none of the pleasant odors of the seashore."* At all events, the dry and absorbent character of the atmosphere relieves the oppression felt in humid climates at high temperatures.

## HUMIDITY, RAINFALL.

The same may be said with reference to extremes of cold, although the average humidity in winter is more than twice as great as in summer. For the year it is 43; at Denver it is 46; at Philadelphia, 73. For spring, summer and fall, it is 37, while for summer it is 28.5. The rainfall averages 17.3 inches a year, 40 per cent. of which is in the spring, 9 in the summer, 25 in the fall, and 25 in the winter. In latitude 40° there should be on general principles 30 inches in a year. Fort Laramie, Sacramento, and Santa Fe have about the same as Salt Lake City; Denver, a little less; while over the entire area of the United States east of the 100th Meridian west from Greenwich, the average annual rainfall is 40 inches, † 60 per cent. of which is at once thrown off in the river drainage. Nothing in the meterological register of the last seven years indicates that the climate of Utah is growing moister; but Rush Lake rolls its blue waves over what was a meadow 20 years ago, and Great Salt Lake has at least ten feet of brine where wagons were driven to and fro in 1863. It has not gained any in contents in the last decade, however, and it would be nowise surprising were it to recede again to its old level. If the rainfall has increased because of the greater area of land cultivated and quantity of water diffused by irrigation as well as of the currents tapped in opening mines, the lake may be expected to retain its present level. Increased humidity has followed the settlement and cultivation of the Mississippi Valley prairies, and it is not unlikely that it is doing so in Utah, although there is not sufficient data as yet upon which to assert it. A peculiarity of the climate is the preponderance of rainfall in the spring, when it is most needed. Could a part of the moisture that is precipitated in winter be transferred to the summer, there would be no necessity for irrigation. The days on which there is preciptation average one in four, but not half of them are really stormy days. There is hardly ever a cloud in the skies of Utah through which the sun is not looking.

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* Surgeon E. P. Vollum, U. S. A.

† Blodget.

## RESUME.

The mean air-pressure at Salt Lake City is 25.63 inches; water boils at 204.3°. The prevailing winds are from the north-northwest, and the most windy months are March, July, August, and September. The mean velocity of the winds during the entire year is 5⅓ miles an hour. On the ocean it is 18; at Liverpool it is 13; at Toronto, 9; at Philadelphia, 11. The climate of Utah on the whole is not unlike that of northwestern Texas and New Mexico, and is agreeable except for a month or so in winter, and then the temperature seldom falls to zero, or snow to a greater depth than a foot; and it soon melts away, although it sometimes affords a few days' sleighing. The spring opens in March, the atmosphere becomes clear as a dewdrop, deciduous trees burst into leafy bloom, and the green of the valleys pursues the retiring snow-line up the mountain slopes. The summer is pleasant in its onset, accompanied by fragrant airs and full streams. Springs of sweet water, fed largely from the surface, bubble forth everywhere. But as the season advances the heat increases, the winds become laden with dust, the storms are mainly dry, the springs fail or become brackish from concentration of their mineral salts, the streams run low, and vegetation parches unless artificially watered. Still, from the rapid radiation at the earth's surface, the nights are agreeably cool and give strength to bear the heat of the days. In October the air clears up again as in spring, and the landscape softens with the rich colors of the dying vegetation, which reaches up the mountain sides to their summits in places, but on them the gorgeous picture is soon overlaid by the first snows of approaching winter. The fall is delightful and generally lingers nearly to the end of the year.

## SANITARY.

The dry air and slight rainfall peculiarly adapt Utah to that out-of-door living, tramping, and camping which so quickly renovates a broken-down nerve apparatus, and through that all organic processes. Pure water and wholesome food are abundant. One has a choice of altitude ranging between 4,300 and 10,000 feet above the sea, access to a variety of mineral springs with remedial qualities for many ills, and what has been termed by many, "the finest salt water bathing in the world." There is no question that the climate is unique in some respects, doubtless induced by an altitude of 4250 feet above the sea, by the distance inland, by the proximity of a massive mountain range on the one hand, and of 2500 square miles of water on the other. This sheet of water absorbs the impurities of the air which moves upon its face as the prevailing northwest wind. Possibly the winds absorb something saline from the salt water in return. The water also modifies the temperature so that only about once in five years does the mercury rise above 100 Fahrenheit, or sink to zero. On the other hand, the mountains, covered with snow half the year and concealing within their recesses no bogs or morasses, rarefy and purify the air and assure that degree of circulation which prevents the gathering of electric storms.

The climate attains that medium between the rigor of the great fresh-water lakes region, and the eternal summer of Florida and Southern California, which makes it both pleasant and healthful. The normal winter is a Washington winter, thirty or forty days of moderately cold weather, with enough snow for a week or two of sleighing. Utah has Colorado's sunshine without her dust storms, her extremes of cold in winter, her high winds, and her sudden changes in temperature.. As already noted, only in one month in four does the monthly range exceed 50°, Fahrenheit. There is a high thermometer in July and August, but by the dryness of the air ten degrees less oppressive than the same level in lower altitudes. The Indian summer holds to Thanksgiving, while the farmer commences ploughing in February. The spring months are far less changeable and have fewer of those raw "clearing-off" winds which make them so dreadful in the East.

In general, the climate is stimulating and bracing. Utah has no malaria, no blood poisoning, none of the more virulent types of fever. Pulmonary complaints, heart disease, asthma, do not originate here, and to those afflicted or threatened in these respects residence in Salt Lake will almost invariably prove beneficial if resorted to in time. One can reach an altitude of 7,000 feet in half a day's ride from the city, with living accomodations, while excursions by easy conveyance can be taken to an altitude of 10,000 feet. There is delightful saltwater bathing, and thermal springs of helpful properties in a good many cases of disease. Here people come from boasted sanitary localities and for the first time find relief.

## AGRICULTURAL.

There were surveyed of public land in Utah, down to June 30, 1887, 11,711,118 acres, arable, timbered, coal, and mineral. Only that which can be artificially watered is really arable, although lands not subject to water are being more and more brought under cultivation, and in many places certain crops can be and are. raised on such lands with no more than ordinary chances of failure, elsewhere. But irrigation cannot be safely dispensed with as a rule. It is usually done by colonies or communities uniting to divert part or the whole of a stream from its natural channel on to the adjoining land, each member of the association then having his proportional right to the use of the water. While it involves outlay or labor on the start, it is not without its advantages. In other regions excess of rainfall often retards the putting in of crops in the spring, and damages hay and grain in the harvest season, by lodging, causing mildew, rust or sprouting, and with hay, leaching out its natural juice. Again, want of the ordinary rainfall often involves a widespread failure of all crops, causing extreme fluctuation in prices and inducing famines. In rainless countries the ill effects of these excesses of nature are avoided. The farmer can control seed time and harvest, and it is a striking fact that Egypt, Mexico, and Peru, all rainless, were the singular and sole birthplaces of civilization. Further, the soil is constantly enriched by materials, salts and earths, held in solution by the water, if it is kept on the land till absorbed. But few of the standard crops of Utah ever require more than two or three waterings to perfect them, some of them, especially fall wheat, seldom needing more than one. Most of the smaller streams that could easily be diverted from their natural channels, have been already utilized; but their full capacity as irrigating supplies, which can only be exhausted by means of dams, reservoirs, and canals of considerable importance, has not as yet been called into requisition.

## AREA OF ARABLE LANDS.

As it is an interesting and important question, Major Powell, of the Geological Survey, approximately measured the volume of all the Utah streams, and found that, calculating the irrigating duty at 100 acres for each one cubic foot of water that could be delivered per second, there is enough to irrigate about 1,500,000 acres. But in 1875, according to returns collected and published by the legislature of Utah, one-third of the ground cropped was not irrigated at all. The irrigating duty, is, considering this, and also the fact that in Southern Europe and India it is 120 acres, average, per cubic foot per second, much too low. It should be put at 150 acres, and that would give 2,250,000 acres of tillable land. The capacity of these streams for irrigating can doubtless be largely increased by a system of reservoirs—a question of engineering. It has been found, too, that beside the storage of irrigating waters in reservoirs, and the enlarging of ditches so as to lessen the losses through absorption and evaporation, a great saving can be effected by early planting. By this, crops will get a better start, and can be made, practically, while the water supply is most profuse. The soil should also be stirred six to twelve inches in depth, and in the fall. The ground will then become a storehouse of water during the winter and early spring, and slight irrigation will be sufficient. Cross ditches for the distribution of the water should be made more frequent. An important advantage would be gained by increasing the area of grass land, comparatively, since this can be watered and given a good start before the wheat and other crops need watering. Experiments have shown that wheat planted in drills 18 inches apart and cultivated, gives the best result. The yield is greater, the quality better, weeds are kept down, and irrigation rendered easy and saving. The soil should be stirred deeply for corn, and the seed planted in April. The crop should be cultivated three or four times, kept clean, and irrigated once slightly about the middle of June and once thoroughly about a month later.

Finally, there are many springs, and a great deal of land that can, and untimately will be watered from wells; artesian, or windmill wells. Artesian well makers say that water can be found anywhere, the question being one of depth only. The French have sunk 75 to 100 wells in Saharah, which yields 600,000 gallons an hour, sufficing for 25,000 acres of mixed crops. At Onarga, Illinois, 85 miles south of Chicago, within a circle of 40 miles in diameter, are 200 wells, averaging about 75 feet in depth, and yielding 2,225 gallons of water each per hour. In California there are a thousand artesian wells, and most of them flowing.

Utah now numbers its flowing wells by hundreds. Although no great volume is discharged by any of them, their wide distribution and great number and ease with which they are driven (their depth being only from 100 to 300 feet) compensate for the absence of really great "spouters." There are large areas in almost every country that might thus be made fruitful and valuable as any land in the world by this simple device. It might be good policy for the Legislature to encourage in some way the sinking of artesian wells.

It is not exaggerating to put the possible farming land of Utah at 3,000,000 acres. A certain 40 square miles of land in Valencia, Spain, under the canals of the Turia, sustains 70,960 souls. At the same rate, with the same strength of soil, the same tilth, sun, seasons, skill, and frugality, the arable land of Utah would sustain more than 8,000,000. So while the proportion of arable land seems small (6 per cent. of the whole) there need be no fear of a scarcity.

## HIGH CULTIVATION.

The necessity of irrigation keeps down the size of farms, and thus induces high cultivation. The magnificent farming of Belgium on poor soil is due, (1,) to the perfection of both plow and spade work; (2,) to each field being shaped with the view to facilitate cultivation and drainage; (3,) to a most careful husbanding of fertilizers—M. DeLavely says "the Flemish farmer scrupulously collects every atom of sewage from the towns, he guards his manure like a treasure, puts a roof over it to prevent the rain and the sun from spoiling it, he gathers mud from rivers and canals and the excretions of animals along the highroads and the ways for conversion into phosphates"—; (4,) to the great variety of crops, especially of industrial plants, such as colza, flax, tobacco, hops, chicory, &c.; (5,) to second or stolen crops, such as turnips and carrots, English clover, sparry, &c., whereby the cultivated area is in effect increased one-third; (6,) to abundance of food for cattle —although the soil is not favorable to meadows, yet taking the second crop into account, one-half of the available superfices is devoted to the keeping of live stock—; (7,) to house-feeding of cattle, by which the cows give both more milk and more manure; (8,) to minute weeding.

Divide Utah's 3,000,000 acres into 120,000 farms of 25 acres each; let them be farmed as above and with the view, being so far inland, of turning everything into stock; depending largely on lucerne, green crops, and ensilage, (the preservation of crops in green state in pits for fodder)—the yearly outturn would be marvelous, almost equal to the yearly revenue of the National Government. Ten acres of ensilaged maize will feed 140 cows and horses for seven months. The maize or other green crop is mown in flower, cut into one-half inch pieces, placed in pits or silos, oval in form and of any desired capacity, with smooth bottom and walls, covered with planks fitting nicely and a great weight piled upon them, which causes the chopped fodder to settle together gradually but compactly and excludes the air. When wanted for use it is cut down as if it were hay and fed out; mixed with a little bran or cotton-seed meal, 60 pounds of it makes a daily ration for a milch cow. Twenty-five to seventy-five tons of maize can be produced on a single acre anywhere within the climatic area of Indian corn cultivation. This system, if it prove in fact half equal to what is claimed for it, will work intensely in the direction of small farms under high cultivation, without implying very hard or long hours of labor.

The Island of Jersey is about the size of one of our townships, yet it sustains 12,000 head of cattle, and annually exports 2,000 head. Land rents at $45 an acre and the whole island is a garden. Supposing there to be 130 townships of arable land in Utah, raising the Jersey cattle and as many of them on the same area, there would be more than 1,500,000 head, and 250,000 head annually sold off for export. The Territory yearly turns off perhaps $2,500,000 worth of beef and mutton on foot; of wool, wheat, potatoes, fruit, eggs, chickens, butter, etc.; but it yearly imports of corn, oats, canned goods, bacon, hams, lard, cheese, beans, crackers, starch, etc., nearly 10,000 tons. With plenty of soil that will yield 25 bushels of wheat, 10 tons of lucerne, and 250 bushels of potatoes to the acre, and no scarcity of water, all we use we should raise, and what we sell should be profit.

There are 12,000 farms in Utah, averaging 25 acres each. Suppose their owners' energies to be turned mainly to the production of beef, mutton, and pork, and the products of the dairy: Ten acres in lucerne would give them 100 tons of hay, 5 acres in maize, put down in silos or pits as above, would give them 250 tons of food as good as growing clover, and they would have ten acres left for garden, fruit, grain, roots, etc. On such a farm, with the outlying pasturage claimed and that can be can be claimed by nobody, 100 head of stock cattle, average value $20, or their equivalent, could be turned off, yearly, after a little. A hundred and twenty thousand such farms, $2,000 each=$240,000,000! Do not repeat that these mountain States can never be thickly peopled because there is so little arable land. There is enough, and the time will come when Utah, at least that part of it under the copious waters of the Wasatch Range, will be a garden, owned by nabobs. For really it can have no serious competition within 500 miles, east or west, all mining country, too, because the Sierra Madre, ond the Sierra Nevada shed their waters outward for the most part, and do not silt down so fine a soil.

*It is the judgment of* one of the best informed men we know, a man who *has been a resident of* Utah thirty-seven years, and who has had a good deal to do with securing rights of way for railroads in this valley, that the average value of the improved lands of Utah is $35 an acre. The best of it in favorable localities is worth $200 an acre and even more, and some of the best of it was "alkali land" at first. From this high-water mark it runs down to $5 an acre. This estimate is upon farming lands, exclusive of suburban lands.

## PRODUCTS.

*Wheat.*—Fair Utah wheat ranks in the East with the best No. 2 red, which is the highest grade that appears in most of the Eastern markets. The choicest qualities are a unique product, with scarcely an equal in America. Last year some 200,000 bushels were exported, the wheat going west, as well as to Colorado and Kansas City. Utah wheat has a brighter, larger kernel than that of the East, and though no handsomer than that of California, it is firmer, and its nutriment more concentrated. As high as 60 bushels per acre have been raised here, but the average yield is not over one-half of that. A careful estimate shows that the wheat crop of 1887 must have been in the neighborhood of 3,250,000 bushels.

The largest wheat regions are in Cache and Utah counties, closely followed by San Pete, Salt Lake, and Weber counties. The great staple is, however, raised throughout the entire Territory. Utah wheat rarely falls in prices below 1 cent per pound free on board.

*Oats.*—Parties who are keeping up work-horses pay 25 to 30 per cent. more for Utah oats of ordinary quality than for a fair grade of Eastern. Nothing more conclusive can be said of the real value of Utah oats than this, which, after all, only represents current opinion among those who have tried them. Utah oats have ranged in prices during recent years from 1¼ to 1¾ cents per pound on cars. Some 200 car-loads were shipped in 1886. The estimated crop is a million and a quarter bushels for 1887, and large farms have been known to realize an average of 85 bushels to the acre by high cultivation.

*Barley.*—Usually Utah barley is of magnificent appearance. In 1885 brewing barley was exported in great quantities to Saint Louis, Milwaukee, California, and other points, where it invariably graded as fully up to the best Canadian brewing. It is the use of this barley that gives Utah beer so high a standard. Indeed, the white-club brewing barley will hold its own anywhere as a strictly fancy product. Some 500 car-loads of barley, chiefly brewing, were shipped in 1886, not less than 75 of which went from the noted barley district of Spanish Fork. The crop of 1887 is not less than 600,000 bushels.

*Rye.*—There are a few cars of rye annually offered at figures ranging over 1 cent per pound. The quality is superb and the yield fair.

*Corn.*—Utah does not pose as a corn country and rarely has any for export. The hot sultry nights which corn requires are not charecteristic of the climate. East of the Wasatch Mountains, however, especially at Green River, it is likely that corn-growing will prove a considerable industry. A farmer at Blake, Emery county, sent some corn-stalks into Salt Lake, 15 feet high.

"just to show", as he said, "what kind of a country this is." Still, it must not be supposed that farmers cannot raise corn all over the Territory, as 500,000 bushels are annually produced.

*Grasses.*—In the improvement of Utah lands there remains untilled and scarcely prized, a considerable area of rough ground too dry for grass and too broken and stony for grain. This is now being utilized for alfalfa, which succeeds almost anywhere in Utah. All the other tame grasses common to this latitude do well in Utah.

*Potatoes.*—The Utah potato has a reputation for excellence all over America and even in Great Britain. Other climes have tried in vain to match the Utah product. For many years great quantities have been exported from this Territory, and it looks as if Utah will continue to do so for all time to come. The exports for 1887 probably reached 12,000,000 pounds; the previous year it was 10,000,000 pounds. One lot of 16 bushels went, throughout 12 potatoes only to the bushel. The bulk of the potatoes raised and marketed are Early Rose, Early Goodrich, Willard, and the Peerless. The King of the Early, Peerless, and Compton's Surprise yield, in favored localities, about 400 bushels to the acre. With high cultivation 800 bushels have been raised to the acre. With proper treatment potato-growing does not impoverish the land, some of the best results coming from ground that has been in potatoes right along for the last twenty years.

*Other roots.*—Utah has also a fine reputation for carrots, which sometimes yield, of good quality, as much as 1,000 bushels to the acre; also for tomatoes, onions, turnips, parsnips, radishes, etc. Beets thrive astonishingly well, and far-seeing men foretell that one day the large tracts of low-lying but now unwatered lands on the western side of the Salt Lake Valley and elsewhere will be under cultivation to the sugar-beet for the manufacture of sugar.

*Green stuffs.*—Of green stuffs Utah annually exports large quantities of cabbage, cauliflower, melons, squashes, and celery, the latter growing exceptionally fine.

*Hops* are also native to Utah, its trailing vines literally overrunning every other kind of foliage in many of the canons. The picking of wild hops has yielded considerable pin-money to the country people, and nature could not tell in plainer words that this is pre-eminently a region favorable to their cultivation. One or two parties, notably on the Provo Bench, have heeded this suggestion, and several hop-gardens of wide extent have there produced many tons of a very choice quality.

The net value of these garden products in 1887 has been carefully estimated at $1,550,000.

## TIMBER.

Utah holds an intermediate position, with respect to the supply of timber, between the Atlantic and Prairie States. Its arable lands are not interspersed with forest, nor yet is it without an adequate supply of timber within its own limits for building, fencing, mining, and fuel. The valleys and plains are destitute of forest growth, and in early times willow brush was resorted to for fencing, adobe bricks for building, and sage brush for fuel. But the mountains are generally more or less wooded, almost wholly with evergreens, however. The best trees furnish lumber not technically clear, but the knots are held so fast that they are no real detriment, and the lumber is practically clear. The red pine and black balsam, indigenous to the mountains, make a fence post or railroad tie that will last ten years. The white pine is not so good. More than half of the forest growth of the Wasatch is of the white or inferior variety. On the Oquirrh the trees are chiefly red pine. Scrub cedar and pinyon pine are quite common in the south and west. They are of little value for anything but posts, ties and fuel. There are several saw-mills in operation in the Territory, and while the people are not enabled by law to acquire title to timbered lands, nor authorized to appropriate the timber on other than mineral lands, nor that, save for domestic uses, they are permitted to use the timber subject only to the condition that they shall not waste it, or cut the trees under a certain stated size. Ordinary rough building and fencing lumber ranges in price from $15 to $20 a thousand. Flooring and finishing lumber is imported, and costs $30 to $40 a thousand. Wood is obtained from the canyons for fuel, and soft coal of good quality can be had for $4 to $6 a ton in all Northern Utah.

## FRUIT.

The climate and soil of Salt Lake Basin are peculiarly well adapted to fruit-growing. The trees are vigorous growers and generous bearers; fruits, especially if half that sets be knocked off, large, fair, and fine-flavored; the crop remarkably sure. The higher valleys are of course comparatively less favorable to this industry. In the South, on the Rio Colorado, grapes do well, and wine-making is a growing business. The climate resembles that of Southern California, where cotton, tobacco, oranges, and semi-tropical products generally, are successfully cultivated. There is room for great improvement in the introduction of new varieties, too many of the trees, especially apples and peaches, being seedlings; and also in care, from a lack of which apples in some localities are growing yearly more infected with worms, and the trees with all kinds of noxious insects, minute red spiders, lice, etc. Formerly people pointed to their orchards as the fairest features of the landscape. Such a straight, thrifty growth, the limbs and shoots seemingly swelled with wine or even blood for sap, and laden with the handsomest fruit, more than they could bear up, even with the aid of props. Now, from this invasion of worms and bugs, many disgusted or discouraged, are digging up their orchards. Amongst the remedies suggested, the importation of certain birds, plentiful in the Western States (cedar birds, indigo birds, orchard orioles, single black billed cuckoos, summer warblers), which subsist almost entirely on insects and worms, especially the latter, as has been demonstrated by experiment, would cost little and promise much The Legislature might well provide the means and authorize some one to do it. Small fruits, *all kinds of berries*, grapes, currants, etc., do remarkably well in the valleys of Utah. The plants are easily propagated, grow thriftily and bear prolifically; while the fruits are large and of good flavor, and the crop hardly ever fails.

The following table shows the area, the product, and the yield per acre, of fruits, for the year 1875, as returned and published by order of the Legislature. [It is the only existing data on this point.] A more recent report would of course show a larger area in fruits, and a correspondingly greater yield.

| Fruit. | Acres. | Total Yield | Yield per Acre. |
|---|---|---|---|
| Apples | 3,935 | 358,277 bushels. | 90 bushels. |
| Pears | 123 | 10.5 0 “ | 75 “ |
| Peaches | 2,6 6 | 330.535 “ | 120 “ |
| Plums | 259 | 43,585 “ | 165 “ |
| Apricots | 305 | 44,160 “ | 145 “ |
| Cherries | 62 | 4,661 “ | 75 “ |
| Grapes | 544 | 3,409,200 lbs. | 6,260 lbs |

**Total Acres, 7,940. Value, $1,028.616.**

## PASTURAGE, STOCK RAISING.

One great resource of Utah, and one not easily discounted, so to speak, is the very extensive stock range. There is in such a country necessarily a great deal of land on the foot-hill slopes and river terraces which cannot be artificially watered, and yet is not cut off from water. The native grasses are probably not as good as the buffalo and gramma grasses of the plains east of the Rocky Mountains, but the bunch grass, which seems to be indigenous to the broken and elevated region between the Sierra Madre and the Sierra Nevada, is only second to them in excellence. Throughout the entire basin millions of acres are not absolute desert only because of the existence of this grass. It grows in bunches in apparently the most barren places. Early in the season it cures, standing, retaining all its nutriment, and being hard to cover with snow beyond the reach of stock. Its seed is pyriform, and has remarkable fattening properties. In the high, dry bracing altitudes of the interior, cattle grow and fatten on much less than on the sea level, and the same degree of either heat or cold, as marked by the thermometer, appears to affect them less. The grazing lands of Utah are almost unlimited, including the second tables of the river courses, the slopes of the foot-hills and lesser ranges not too far from water, the shores of the sinks and lakes, and the coves and valleys of the mountains. In the Salt Lake Basin, generally, stock winters without fodder; further south, they not only subsist, but thrive on the range the year round. In Cache, Bear Lake, and other valleys more elevated, they require more food and shelter; and the stock-grower will do well to prepare for occasional cold and snowy spells in all the northern parts of the Territory. There is ample hay ground for this. Under ordinary circumstances, a five-year-old steer, worth $30, can be turned out for $5. Still, candor compels the confession that Utah is not a great stock country in the sense in which the term has come to be used in the West. Its native grasses have no turf to speak of, and if fed close are soon tramped out. They require nursing. The sense in which it is a fine stock country has been *indicated under the heading of* “High Cultivation”. The yearly drive, outward, has come to be, according to the best estimates obtainable, 50,000 head of stock cattle, averaging $20 each in value. There are in Utah 500,000 cattle, 250,000 horses and 100,000 hogs.

## WOOL GROWING.

There can hardly be less than 2,000,000 sheep in Utah. 12,000,000 pounds of wool were handled by Utah buyers in 1887. Of this about one-fourth is worked up by the Utah mills. Fleeces average 5 pounds for ewes, 7 pounds for wethers. Part of it ranges with the best California wools, as to quality, while part of it is inferior. Utah and Montana wools are considered better than the wools of the other Territories. Most of the Utah sheep came from New Mexico down to 1870. Since then ewes have been brought in from California, generally fine-wooled Spanish Merinos, but little mixed; fine-wooled bucks from Ohio, and long-wooled from Canada. The same strain of blood in sheep does not produce quite so long a wool as in the east. It is so dry and dusty, the grease seems to absorb the alkali and mineral dust, which makes it harsher and more brittle. But since the large infusion of Merino blood, which has taken place in late years, there has been a marked improvement in the quality of Utah wool, in respect of length, softness and firmness of fibre. It realizes to the grower, here, crude, about fifteen to twenty cents a pound, according to the range of prices abroad. The strain of blood in cattle, horses, and sheep has been greatly improved in recent years, but it is still the point requiring attention. In Vermont the breeder with the best ram has the precedence. Inferior wool comes from shiftless, careless breeding. An authority says, aim for the best mutton if you would get the best wool. This is the system in England, the great mutton-producing and combing-wool-producing country of the world. The characteristic qualities of the English combing wools have been developed upon originally short-wooled animals simply through a constant effort to improve their carcasses for the mutton market. From this it seems that the interests of the grower, the consumer of meat, and the manufacturer of wool, are identical, and they all depend upon the quality of the stock ram of the flock.

Castle Valley, near the corner post of Wasatch, Sanpete and Utah counties, is a great sheep range, several large flocks being kept there. They are worth about $3.00 a head as they run, do not require feeding in winter, and if properly attended to, under ordinary circumstances, will yield a profit of 40 per cent. a year on the investment. They are beginning to be driven away in considerable flocks. Costing in May perhaps $3.00, including lambs, by the time they arrive in Montana or Colorado the lambs are worth as much as the sheep and the buyer has doubled his money at once. A more inviting field for capital and enterprise, for skill and care, than the production of beef, mutton, and wool in Utah, it would be hard to find, anywhere. As the feed begins to give out on the lower benches in the spring, the snow line is receding on the foot-hills, and stock is pastured at higher altitudes as the season advances, until in the midsummer they graze among the grassy valleys of the mountains, and on the cool, high plateaus. When winter approaches they gradually retire again, and by the time of general snow-fall are roaming over low, wide ranges where they cannot exist in summer for heat and want of water. This changing life brings them health and hardihood. They have a "summer out" every year, and are thus developed into the sturdiest races of America. The ranges of one season are held in reserve at another. During the summer, on the millions of acres of the interior basins, too dry for summer ranges, the native bunch grass is maturing and cures, standing, ready for the immense flocks and herds which will winter there. In these regions the snow-fall is light enough to furnish water for the stock, but not to bury the dry, fattening bunch grass, famous for its nutritive qualities. Such, in round terms, is the manner of raising cattle, horses, and sheep in Utah, and the quintupling of these interests in the last six years is sufficient proof of its excellence. Taken altogether, there are not fewer than 3,000,000 animals herded in Utah, against 504,520 reported by the Bureau of Statistics in 1876. Besides this increase in numbers, the intrinsic value per head of cattle and horses is almost doubled, while that of sheep has been greatly improved.

## THE MINING INDUSTRY.

Mining for the precious metals began about twenty-five years ago, but not much was done until after the completion of the first Pacific railroad. This gave our ores and bullion a market, and from 1874 to 1887, both inclusive, total output of Utah mines was as follows:

| | |
|---|---|
| Gold, 148,316 fine ozs, at $20.67 per oz | $3.065,692.72 |
| Silver, 65,226.753 fine ozs, commercial value | 73.201,966.51 |
| Lead, 689.630,705 lbs,, " " | 36.799,599.17 |
| Copper, 19,044,995 lbs., " " | 3,003,889.21 |
| Total | $113,071,146.61 |

The price of silver, lead and copper is taken from the New York *Engineering and Mining Journal* of January 7, 1888, and is obtained by averaging the price for each month, and then averaging it for the months of each year. It will be seen from the tables appended hereto, that the average commercial value of silver for the entire period was $1.122 per ounce; of lead, 4.896 cents per lb.; of copper, 19 cents per lb. The amount of lead is obtained by deducting 5 per cent. from amount of lead bullion for loss in refining, and adding to the remainder the amount of lead refined in Utah. The amount of copper is obtained by assuming that our lead bullion contained one per cent. of copper, exclusive of loss in refining, for the first five years, 2 per cent. fer the second five years, 3 per cent. for the third five years, and five per cent. for the last two years. This is meant to include copper in furnace matter shipped out, and there is no doubt that it is an under-estimate rather than an over-estimate. The amount of gold in the earlier years is obtained by assuming that our lead bullion contained an average of one-third of an ounce per ton, which is true of it now. This is also an under rather than an over-estimate. Of the amount of lead and silver there has been an accurate yearly report from the first. If the silver were to be computed at its coining rate, which is the rate at which so much of it as is coined, passes in exchange, our product would be thereby increased to

$123,998,848.98. The difference, namely, $10,927,702.37, represents the loss on silver to our miners from legislation inimical to the use of silver as money. Price of lead in this calculation is in currency since resumption,—in gold for 1871–1878 inclusive. Following is the record of gold and silver production for the past seventeen years:

| Year. | OZ. GOLD, $20.67. | | SILVER. | | | | Gold & Silver |
|---|---|---|---|---|---|---|---|
| | Fine oz $20.67. | Value. | Fine ozs. | Price per ounce. | Commercial Value. | Coining Value. | Commercial Value. |
| 1871 | $1,839 | $38,012.13 | 634,685 | $1,326 | $841,592.31 | $820,584.23 | $879,604.44 |
| 1872 | 3,923 | 81,088.41 | 1,353,435 | 1,322 | 1,789,241.07 | 1,749,856.11 | 1,870,329.48 |
| 1873 | 5,447 | 112,589.49 | 1,879,330 | 1,298 | 2,439,370,34 | 2,429,785.75 | 2,551,959.83 |
| 1874 | 5.552 | 114,759.84 | 1,905,090 | 1,278 | 2,434,705.02 | 2,463,090.86 | 2,549,464.86 |
| 1875 | 6.033 | 124,702.11 | 2,081,500 | 1,246 | 2,593,549.00 | 2,489,171.35 | 2,718,251.11 |
| 1876 | 8.820 | 182,309.40 | 1,946,915 | 1,156 | 2,250,633.74 | 2,517,166.40 | 2,432,943.14 |
| 1877 | 17.325 | 348,107.75 | 4,359,703 | 1,201 | 5,236,003.30 | 5,636,660,00 | 5.594,111.05 |
| 1878 | 15.040 | 310,876.80 | 4,357,328 | 1,152 | 5,019,641.85 | 5,633,589.37 | 5,330,518.65 |
| 1879 | 15.932 | 329,314.44 | 3,835,047 | 1,123 | 4,306,757·78 | 4,958,332.26 | 4,636,072.22 |
| 1880 | 8.020 | 165,773.40 | 3,783,566 | 1,145 | 4,370,018.07 | 4,891,772.48 | 4,535,791.47 |
| 1881 | 7.958 | 164,491.86 | 5,400,191 | 1,138 | 6,145,417.35 | 6,981,906.94 | 6,309,909.21 |
| 1882 | 9.039 | 186,836.13 | 5,435,444 | 1,136 | 6,174,664.38 | 7,027,485.54 | 6,361,500.51 |
| 1883 | 6.991 | 144,503.97 | 4,531,763 | 1,118 | 5,066,511.03 | 5,819,116.38 | 5,211,015.00 |
| 1884 | 5.530 | 114,305.10 | 5,669,488 | 1,113 | 6,310,140.14 | 7,330,081.03 | 6,424,445.24 |
| 1885 | 8.903 | 184,025.01 | 5,972,689 | 1,064.08 | 6,359,719.24 | 7,722,089.60 | 6,543,744.25 |
| 1886 | 10.577 | 218,626.59 | 5,918,842 | 994.64 | 5,887,117.0 | 7,652.470.82 | 6,105,743.59 |
| 1887 | 11.387 | 235,369.29 | 6,161,737 | 97 | 5,976,884.89 | 7,966,609.76 | 6,212,254.18 |
| | $148.316 | $3,065,691.72 | 65,226,753 | $1,122.27 | $73,201,966.51 | $84,128,668.88 | $76,267,658.23 |

Following is the lead product by years for the same period—1871 to 1887 inclusive:

LEAD LBS.

| Year. | Refined. | Bullion. | Reduced to 5 per cent. off for loss. | Price per lb. | Value. Av. $4,8967 per lb. |
|---|---|---|---|---|---|
| 1871 | | 11,038,530 | 10,486,604 | $6.08 | $637,575.52 |
| 1872 | | 23,538,490 | 22,361,566 | 6.30 | 1,408,778.65 |
| 1873 | | 32,684,511 | 31,050,286 | 6.32 | 1,962,378.07 |
| 1874 | | 33,132,731 | 31,476,095 | 6.01 | 1,891,713.30 |
| 1875 | | 36,200,117 | 34,390,112 | 5.85 | 2,011,821.55 |
| 1876 | | 50,401,893 | 47,881,799 | 6.13 | 2,935,154.21 |
| 1877 | | 54,936,080 | 52,189,276 | 5.49 | 2,865,191.25 |
| 1878 | 2,620,422 | 40;414,359 | 38,393,642 | 3.61 | 1,480,607.71 |
| 1879 | 2,301,276 | 26,411,359 | 27,420,568 | 4.14 | 1,135,211.51 |
| 1880 | 2,892,498 | 26,442,093 | 28,012,487 | 5.04 | 1,411,829.34 |
| 1881 | 2,645,373 | 42,191,625 | 42,727,417 | 4.81 | 2,055,188.75 |
| 1882 | 8,213, 98 | 52,349,850 | 57,946,156 | 4.91 | 2,845,156.25 |
| 1883 | 3,230,547 | 63,431,964 | 63,490,913 | 4.32 | 2,742,807.44 |
| 1884 | 4,840,987 | 56,023,893 | 58,063,688 | 3.74 | 2,171,581.85 |
| 1885 | | 54,318,776 | 51,602,838 | 3.95 | 2,038,312.10 |
| 1886 | 208,800 | 48,456,260 | 46,242,247 | 4.63 | 2,141,016.03 |
| 1887 | 2,500,000 | 45,678,961 | 45,895,013 | 4.50 | 2,065,275.58 |
| | | | 689,630,705 | | $33,799,599.17 |

Following is the copper product and the totals—lead and copper, and gold, silver, lead and copper, by years for the same period:

| Year. | COPPER. | | | LEAD, COPPER. | GOLD, SILVER, LEAD, COPPER. |
|---|---|---|---|---|---|
| | Lbs. | Price per lb | Value. | Value. | Total Value. |
| 1871 | *110,385 | 22⅝ | $24,973.60 | $662,549.12 | $1,542,153.55 |
| 1872 | 235,384 | 33 | 77,676.72 | 1,486,255.37 | 3,356,784.86 |
| 1873 | 326,835 | 29 | 94,785.05 | 2,057,163.12 | 4,609,122.95 |
| 1874 | 331,327 | 23¼ | 77,033.53 | 1,968,746.83 | 4,518,211.69 |
| 1875 | 362,001 | 22½ | 81,450.22 | 2,093,271.77 | 4,811,522.88 |
| 1876 | †1,008,036 | 21 | 211,687.56 | 3,146,841.83 | 5,579,784.97 |
| 1877 | 1,098,720 | 18⅝ | 204,636.60 | 3,069,827.85 | 8,663,938.90 |
| 1878 | 863,316 | 16½ | 142,447.14 | 1,623,054.85 | 6,953,573.50 |
| 1879 | 577,152 | 17⅛ | 98,837.28 | 1,234,048.79 | 5,870,121.01 |
| 1880 | 520,992 | 20⅛ | 124,874.64 | 1,535,803.98 | 6,072,595.45 |
| 1881 | ‡1,365,150 | 18⅛ | 247,433.44 | 2,302,622.19 | 8,612,531.40 |
| 1882 | 1,829,229 | 15⅞ | 338,407.36 | 3,183,563.61 | 9,545,064.12 |
| 1883 | 2,004,720 | 13⅛ | 318,249.30 | 3,061,056.74 | 8,272,071.74 |
| 1884 | 1,833,207 | 11½ | 240,583.42 | 2,412,165.27 | 8,836,610.51 |
| 1885 | 1,629,551 | 11 | 181,288.65 | 2,219,600.75 | 8,763,345.00 |
| 1886 | ‖2,433,775 | 11¼ | 267,715.25 | 2,408,821.28 | 8,514,456.87 |
| 1887 | 2,415,195 | 18⅓ | 271,709.44 | 2,336,985.02 | 8,559,239.20 |
| | 19,044,995 | Av. 19 | $3,003,889.29 | $36,803,488.38 | $113,071,146.61 |

*1 per cent. of lead bullion.
†2 per cent. of lead bullion.
‡3 per cent. of lead bullion.
‖4 per cent. of lead bullion.

## DISTRIBUTION OF MINING DISTRICTS.

The mines wrought at the present time are mainly in Beaver, Juab, Summit Salt Lake, Tooele, and Washington counties. The northern mines lie on the same parallel in Tooele, Salt Lake, and Summit counties. The mines of Juab county are eighty or ninety miles south of these. Beaver county is 200 miles and Washington county 300 miles south of Salt Lake City. Mines are wrought to some extent in Wasatch, Weber, Box Elder, and Piute counties. There is in fact no county in the Territory where the prospector has not left his footprints. Wherever, in Utah, there are mountains, mineral indications are not wanting, and valuable minerals are likely to be found in time in paying veins or deposits. Ores of good quality are known to exist in many of the isolated ridges which break the face of the desert in Western Utah, but mining in that section necessarily awaits the construction of railroads. The main producing district of the Wasatch Range lies on the heads of the Cottonwoods and of the American Fork, within sight of Salt Lake City, and over the ridge eastward, where the waters find their way into the Weber and Provo rivers. Northward from this locality, nothing of importance has yet been found, but 200 miles southward, on the head of the Sevier River, eastward of the town of Beaver, there is a district called Marysvale, containing some promising mines, the development of which is retarded by the comparative isolation of the district. Mines are found on both flanks of the Oquirrh Range, from Great Salt Lake southward nearly a hundred miles, as at Stockton, Dry Canon, Ophir, Bingham and Tintic. All these localities, except Marysvale, are connected with Salt Lake City by rail. The mines of Beaver county are at Frisco and about Millford, the terminus at present of the Utah Central Railway. The mines of Washington county occur in a sandstone reef which extends along and near the base of the Wasatch for a hundred miles.

## BEAVER COUNTY.

Beaver county contains four or five parallel ranges or ridges, striking north and south, and all of them mineral-bearing. A single chimney of ore in a contact along the east base of Grampian Mountain, turned out a hundred tons of ore a day for four years, realizing to its owners more than thirteen million dollars, four millions of which was disbursed in dividends. The output of the county, all shipped northward by rail, was, for the past year, 5,369 tons. About thirty mines in Star, Rocky, Lincoln, Frisco, Shauntie and Bradshaw districts contributed to this total, the Horn Silver furnishing 3,291 tons, carrying about 30 ounces of silver and 40 per cent. lead. This light output indicates that mining in Beaver county is at present carried on by men of small means, who, awaiting the time when capital shall come to their aid, get out and ship barely enough ore to keep the pot boiling. The Horn Silver does not belong in the general category of Beaver county mines. It is simply in Borasca.

The facilities for mining in Beaver county are very good. The country is dry as horn in the summer, but there is sufficient water, wood, and timber for mining purposes, and operations are not obstructed by snow or cold in the winter. The ores are carried from the mine dumps by wagon and rail to the Salt Lake smelters at about seven dollars per ton. The mines are usually easy of access. Provisions and supplies are cheap and abundant, and good labor is attainable at fair rates of compensation. There can be no doubt that extensive exploitation and operation in this district would very greatly increase its output.

## JUAB COUNTY.

Tintic is the principal district of Juab county. Its three main ore channels, located under various names, are about half a mile apart, and extend lineally from one to three miles. There is a 10-stamp chloridizing mill, owned by the Northern Spy, or the Tintic M. & M. Co., in the district, but it is not run steadily, most of the ores of the district being shipped to the smelters. Ore shipments for the past year, exclusive of 900 tons treated by the Spy mill, and of about 10,375 tons of iron ore for fluxing purposes, were 22,000 tons. Twenty-five mines contributed to this total, most of them in a small way.

The principal mines are the Eureka Hill, the Beck & Bullion, the Mammoth, and the Northern Spy. The Eureka has produced about 44,000 tons of $65-ore in the past four years, worth about $40 a ton in the Salt Lake *market, or at* Salt Lake. It is a dry ore averaging about 12 per cent. lead, and is mostly bought for the Colorado smelters. The formation is limestone, standing vertically and striking north and south. The ore makes between the strata, seeming to have replaced the limestone. Sometime it is the thickness of one stratum, sometimes of several, and it makes across the stratification as well as with it, in places, so that the workings are on continuous ore for a length of 1,800 feet and a width of 300. The ore-bearing belt is 600 feet wide. A depth of 700 feet has been attained. From the character of the formation and the way in which the ore occurs, the workings are a labyrinth, of which words without maps, can give no idea. The property is owned by a close corporation which makes no public reports. No doubt its profits, or dividends, the past four years, have averaged $300,000 a year.

The Beck & Bullion is a companion mine to the Eureka Hill, adjoining both on the end and side, and a suit for the entire width of the ore-bearing zone between its end lines extended, on the part of the Eureka Hill, has been won in the Territorial courts, and is now pending on appeal in the Supreme Court of the United States. This litigation restricts the operations of both companies. The Beck & Bullion output is something less than half that of the Eureka Hill, and the ore is of a somewhat lower grade. The shaft has reached the fifth level; the aggregate of levels now opened approaches 4,000 feet. The ore shipped is about 10 per cent. lead, and carries 70 ounces of silver, and $2 to $5 gold per ton. The output at present is at the rate of about 6,000 tons a year.

The Gemini takes this belt north of these properties, and the Centennial Eureka north of the Gemini. Both the Gemini and the Centennial Eureka are equipped with steam hoist, are being systematically opened by shaft and levels, yield some good ore, and promise to become valuable properties with development.

The Mammoth lies a mile and a half south of the Eureka Hill group. Its ore chimney is of mammoth proportions, and has yielded, first and last, more than a million dollars. The base of the ore is copper, and it carries a larger proportion of gold than the ordinary lead-silver mines of Utah. The ores vary greatly, both in quality and character, in different parts of the extensive workings and on different levels. The workings have reached a depth of 750 feet and expose a great deal of low-grade ore. The treatment of the ores has been a difficult problem. Various processes have been tried and abandoned. At present, and for a year past, the ores have been selected and graded to about $60 a ton, and shipped to the Argo smelting works near Denver at the rate of 300 tons a month. The company paid $30,000 in dividends the past year.

The Northern Spy has milled 900 tons of ore the past year and shipped about 100 tons. Operations were supended most of the season, pending negotiations for a sale of the property. Worked in a moderate, careful way, the Northern Spy has paid for a 10-stamp chloridizing mill, $30,000 in dividends, $32,000 for contiguous ground, and exposed, ready for stoping, a large reserve of ore.

The Tintic Iron company shipped about 10,500 tons of iron ore to the *smelters for fluxing purposes* the past year, worth, at the smelters, about *$50,000.*

A score of mines not named here are worked in the district in a small way, and send out perhaps an average of a hundred tons each, every year. Many of these mines have immense outcrops, nearly covering the full surface area. The ores are found in bunches and chimneys which will doubtless at greater depth concentrate in paying bodies. All of the Tintic mines which have been extensively exploited, are large and profitable producers, and this should encourage a freer application of means, and more energetic work in the opening and development of such others as promise similar results.

Ores similar to those of the Mammoth, and also lead ores, are found for fifty miles westward of Tintic wherever the surface of the desert is broken, but existing conditions seem to be unfavorable to the profitable working of the mines in this locality.

## SUMMIT COUNTY.

Uintah district lies eastward of the dividing ridge at the head of the Cottonwoods, and comprises all the mines in Summit county. A spur from the Wasatch in this vicinity, striking eastward and then northward, forms the line between Summit, Wasatch and Utah counties, and also between Uintah, Snake Creek and Blue Ledge districts, the latter in Wasatch county, Snake Creek in Utah county. Nothing of any consequence is being done in Blue Ledge District, although mineral indications and claims are plentiful, and they have been the scene of active and extensive operations. The more important of these have been suspended, pending the excavation of a drain tunnel, abundance of water having exhausted the operators. The driving of such a tunnel, while a necessity to the mines of Uintah District, would be the making of Blue Ledge District.

In Snake Creek District, about seven miles south of Park City, a property known as the Southern Tier is being opened up by a series of adits. The locality is broken, and the workings are supposed not to have penetrated the regular solid formation. Still, $10,000 worth of ore was taken out the past season, enough to pay for the work of development, with very little stoping. The ore is 50 per cent. lead and carries 180 ounces silver per ton. Other locations have been made in the vicinity, but the owners are apparently awaiting the results of the Southern Tier's exploitations.

Uintah District is the part of this mining field which the contour of the mountains throws into Summit county. Park City, a town of 3,000 inhabitants, connected with Salt Lake City by rail, is the mining town of the district. The Mackintosh sampling mill is near the depot. The Crescent concentrating and sampling mill and smelter, and the Marsac (Daly) 30-stamp chloridizing mill are in the town, while the Ontario 50-stamp chloridizing mill stands at the head of the main street. The Ontario mine is a mile and a half up Ontario Gulch to the right from the mill.

The Ontario vein, for 4,500 feet on its course, is owned by the Ontario Silver Mining company, for 1,500 feet next westward, by the Daly Mining company. The next 2,800 feet, going westward, is owned by men interested in these two *companies. Here* the Anchor Mining company takes it for 6,800 feet. The latter company put a shaft down 600 feet, near the east end of its property, which cross-cut a fine vein of ore, supposed to be the same as the Ontario, or a parallel vein of similar strength and quality, just below the fifth level. Drifts from the fourth and sixth levels also disclosed the vein, where, from its general dip, it should be. From the Ontario westward, the ground gains in altitude, so that the sixth Ontario level is the Daly eighth, and the Anchor seventeenth. The Anchor is now driving a drain tunnel from the confluence of Sawmill and Webster & Walker gulches, 6,600 feet distant, to strike its twelfth level. The tunnel has a 4-foot cap, a 5-foot sill, is 7 feet high in the clear, with 20x24 inches, and will be completed this year at a cost of $150,000 to the Anchor company. The Ontario sixth level drain tunnel, if extended through the intervening ground, will strike the Anchor seventeenth level, and Ontario fifteenth level drain tunnel, which if possible, starting from Blue Ledge district, would, if extended so far—nearly five miles—take the Anchor water to the twenty-seventh level. If the Anchor has the Ontario or an equivalent parallel vein, then the vein is about 9,000 feet long; and if it extends through the Anchor ground, it is three miles long. There is good reason to suppose that it continues through to the Cottonwood mines, and that it strikes eastward from the Ontario through Blue Ledge about two miles, making in all six or seven miles in length, throughout which, with intervals of barren ground, of course, it may reasonably be expected that this vein will be found to be fertile.

What this vein is in strength and quality of ore, has been shown by the operations of the Ontario and the Daly. There are more than twenty miles of openings in the Ontario. About 130,000 cubic yards have been stoped out. The plant of mine and mill cost $2,570,000; over four hundred men are given employment year after year at an average wage of $100 each per month. The total output of the mine to the end of the past year is, in round numbers, $19,300,000, rating silver at its commercial value; its monthly dividends are 139, aggregating $8,825,000. Rating the silver at its coining value would increase the output to $23,000,000, and the dividends to $12,525,000. This difference represents the loss to a single silver mining company consequent upon the depreciation of silver by inimical legislation.

On the 4,500 feet of vein there are three shafts, Nos. 1 and 2 in Ontario Gulch, No. 3, 1,100 feet further west. The latter, through which 28,500 tons of ore were raised the past year, has rested for three years past on the tenth level. About 37,000 tons of ore were extracted in 1887, altogether, from which the company realized in gross, $1,860,000, and paid $900,000 in dividends. Shaft No. 2 has recently been sunk to the eleventh level. The sixth level drain tunnel three years ago ran 7,300 gallons a minute, of which 2,400 were lifted from the levels below the sixth by the pumps. Now the tunnel runs 5,900 gallons per minute, and the amount raised from the levels below is 2,050 gallons.

This drain tunnel has been extended to a connection with the Daly workings, which it drains to the eighth level, that mine being higher than the Ontario. Many of the levels of the two mines have been run together, the respective shafts being 3,300 feet apart. The Daly began to mill and sell ores in 1885. Its output to the end of 1887 is about $2,100,000; dividends paid, $375,000. The mine is well equipped, and the company own the Marsac mill. Both companies find it to their advantage to sell to the smelters their lead ores—about 22 per cent. of the whole—as they thereby increase their reducing capacity, and, perhaps, get a little more for the ore than they could otherwise obtain.

Many locations in the vicinity of this vein, on each side, and west of the Anchor, have been grouped, patented, titles settled and improvements begun, in the belief that the ground for a mile or two in width, between Ontario Gulch and the Cottonwood mines, offers inducements to the most thorough prospecting. Among the more prominent of these groups are the Massachusetts, comprising twenty locations, a mile west of the original Ontario location, well equipped, the workings already 500 feet deep, shaft and levels, and being extended with encouraging indications. The Putnam group lies south of the Daly, adjoining, and is 600 feet wide by a mile long, mainly patented. The Morgan group, also contiguous to the Daly, is in litigation. The West Ontario Consolidated comprises 121 acres of patented ground, and extends 4,700 feet along the mineral belt. A shaft has been put down 300 feet and levels started. The vein is regular and strong, and rich ore is found.

The Pioneer and Jupiter groups, James M. Kennelly's group, Smith Ethenger's, and the West End property, cover the belt from the Anchor over and down into Big Cottonwood Creek. More or less prospecting has been done on all of them, and the indications are very promising.

The Dolberg group of five claims lies on the hill above and west of the Daly. All this ground is being put in shape for extensive working.

The Sampson property lies immediately east of Pinon Hill, on a line west with the Ontario and Massachusetts, the Daly and Anchor having diverged to the southwest. The Sampson is at the head of Webster & Walker Gulch, much higher than the Massachusetts The vein is in limestone, fifteen feet thick, and strikes through Pinon Hill southwesterly a mile or so, the Sampson, the Boss, the Crescent, and the Apex, each owning a part of it. The ore averages 30 per cent. lead, $1.25 in gold, and 60 ounces in silver per ton. About 400 tons were shipped the past year by the Sampson company, but the energies of the company have recently been devoted to connecting the workings with a long drain tunnel at a depth of 520 feet. This is now done, and the output will be largely increased. The Boss, taking the vein next west, has a shaft and an adit on the vein.

In the year ended with October the Crescent Company sold 1,856 tons of first-class ore, and 3,950 tons of concentrates, for $150,992. Against this ore is charged a total expense of $114,865, about $19 a ton, $5 of which is on account of concentration. The 3,950 tons of concentrates represent upwards of 20,000 tons of crude ore. The concentrating mill, in Park City, is connected with the mine by tramway, which rises 2,000 feet in five miles. The property comprises ninety acres, the ore occurring in a channel twenty rods wide and a quarter of a mile long, falling off to the northwest with the face of the hill, and about 100 feet below the surface. This ore sheet crops out in the eastern face of Pinon Hill, which is a ledge in its abruptness about

400 feet high, and thin veins or fissures occasionally come to the surface from the ore body on the northwestern slope of Pinon Hill. Probably 80,000 tons of ore have been extracted and sold, realizing to mines and smelter $1,200,000, $15 per ton, and many thousands of tons of concentrating ore yet remain in the mine and on the various dumps. Dividends amounting to $210,000 have been paid. The Sampson vein cuts across the head of the property, and is reached at a depth of 400 or 500 feet by a 1,700 foot tunnel from the northwest. Upon this vein, at the inner end of the tunnel, machinery has been placed and a shaft is being put down.

The Apex is a companion property to the Crescent, lying south and contiguous, comprising about twenty locations, and covering a part of the blanket ore-bearing formation of the Crescent. Large bodies of low-grade ore have been exposed by the extensive workings. About 400 tons were marketed the past year, realizing $20,000. This ore is from the Sampson vein, which is cut at a considerable depth by a tunnel from the side of the hill facing Thayne's Canon. Nearly a mile of the Sampson vein is being opened by these three or four companies. So far the ore has been scattered and bunchy, but it is expected to make in larger bodies at a greater depth.

There are besides the properties mentioned a hundred promising prospects scattered all over these hills, from the Cottonwoods to Provo River and from Deer Valley nearly to Midway, a district containing fifty square miles. The country is wet and the drift heavy, making the development of prospects into paying mines slow work. Very little outside capital has ever gone into the district. It has to depend upon its output for the means of increasing its output. Yet it may be truly said that there is no district in the entire mining section which offers greater inducements to capital to engage in mining than this.

The total shipments of ore from Summit County for 1887 were 20,600 tons; 50,063 tons were milled by the Ontario and the Daly companies, making the output of the county for the year 70,663 tons.

## SALT LAKE COUNTY.

The mines of Salt Lake County are at Bingham Canon and on the Cottonwoods, both connected with the Jordan smelters and with Salt Lake City by rail and tramway. About 1,200 tons of ore came out of Little Cottonwood the past year, contributed by a score of mines, the leading shippers being the City Rock, the Joab Lawrence, the Albion, and the Golconda. Prospecting for new ore bodies in the depths of the New Emma, the Flagstaff, and the Eclipse, has been kept up the past year, as for several previous years. These are all on the formation of dolomitic lime 250 feet thick, and pitching into the mountain at an angle of 45 degrees, which strikes across the heads of the Cottonwoods, from American Forks to Mill Creek, five or six miles, and which, located under various names, has turned out eight or ten million dollars. The Eclipse is on the Big Cottonwood side of the divide, and comprises everything between the Flagstaff and the Reed & Benson. It has a fine plant, protected from snow-slides, and shaft down 600 feet, with levels *connecting with the Flagstaff* levels toward the east, and reaching out toward the Reed & Benson on the west. Nearly $300,000 have been expended by this company in the acquisition of title, the provision of plant, and in sinking and drifting, and this is an example of what is going on east and west of the Emma belt, and above and below on the steep slope of the mountains. The results will appear in the future. Crossing into Big Cottonwood, the Maxfield, a location on the Emma belt, is the only mine of importance about which there is much activity at present. The company completed a long tunnel in September last, connecting with the workings from the surface at a very considerable depth, draining off the water and otherwise greatly facilitating the working of the mine. About 500 tons of ore, bringing the company $50 to $60 per ton, was shipped the last quarter of the year. The Silver Mountain, the Kessler, and the Reed & Benson, are prominent mines of Big Cottonwood, and there are a hundred others of more or less promise.

About 28,660 tons of ore were shipped from Bingham the past year. In the earlier years of the district the output largely exceeded this, but when the oxidized ores of the surface had been mainly used up, the output fell off to a point much below what it is at present, and for the past few years it has steadily increased. The great ore channel of the district strikes northeasterly from the summit of the Range, (Oquirrh) about three miles to the valley, crossing upper Bingham, Bear, Yosemite and Copper gulches. Below Bear Gulch, its course is cut off from the range by Bingham Canon, the exposure is to the south, and the ground is comparatively dry. The Brooklyn, the Rosemite, the Yosemite No. 2, the Miner's Dream, the Wasatch, and the Lead mines, are on this part of the great ledge or zone.

The Brooklyn comprises several locations adjoining the Old Telegraph on the northeast. The hoisting works and concentrating mill are in Yosemite Gulch, 300 to 400 feet lower than the divide between it and Bear Gulch. The main incline is on the quartzite footwall, and pitches northwesterly at an angle of 45 degrees. Thirteen levels have been opened along the foot, aggregating in length about three miles. The ore makes in pipes or chimneys 100 to 150 feet long on the course of the ledge, and from two to twelve and twenty feet thick. These chimneys or pipes go down with slight change on the whole, either in dimensions or character of contents. The ores are galena, carbonates, and sulphates, 60 per cent. requiring concentration to bring it to shipping grade, to-wit: ten ounces silver and 50 per cent. lead. Concentration is by jigs and tables, and costs seventy-five cents to one dollar per ton. Three hundred to five hundred tons are shipped per month by the Brooklyn, and have been the past four years. The vein is regular and well defined on the footwall side. The hanging wall, a lime shale, is much less easily located, and is believed to be 400 feet from the footwall.

The formation is complicated by the existence of the Yosemite, comprising several locations, on a vein very like the Brooklyn, parallel, pitching perhaps 20 per cent. less, and 400 to 500 feet toward the hanging country, on which the workings are extensive, both in depth and lineally, although less extensive than the workings of the Brooklyn. The Yosemite is computed to have produced a million and a half. The works are in Yosemite Gulch, the concentrating mill three miles below, in Butterfield Canon. The ground rises each way from Yosemite Gulch, and a great deal of it is still unexploited. Water was struck in the working incline on the sixth level, and the ore became pyrituous, but down near the eighth level it is changing to galena, carrying 16 ounces and upwards of silver. The Brooklyn also struck water in one of its ore pipes on the twelfth level, but the lean iron pyrites which came in thereupon is giving place to galena between the thirteenth and fourteenth levels.

In Copper Gulch, half a mile further east, and 200 or 300 feet lower, these two veins are worked as the Lead and the Yosemite No. 2, and as the Wasatch and the Miner's Dream, respectively. They present the same characteristics and yield the same kind and qualtity of ores as the Yosemite and Brooklyn. A tramway four or five miles long, belonging to the Lead, conveys the ores by gravity to the Lead concentrating mill on the railway in Lower Bingham. The workings of the Lead are 700 feet deep at present, with the exception of the Brooklyn workings, the deepest in the district. That at this depth, they have a larger and better body of ore than ever, is encouraging for the whole district. The Lead shipped at the rate of 300 to 400 tons per month the past year, and could largely increase this rate of output if it were desirable. The Wasatch and Miner's Dream are opened by incline to a depth of 600 feet, the Yosemite No. 2 by adit and incline from the adit. Although shipping some ore, they are not regarded as having really reached, as yet, the producing stage.

West of the Brooklyn and the Yosemite, in the Old Telegraph, on Bear Gulch, where the exposure is to the northward, these two veins, if such they are, seem to have become one. The clean marketable ore on this property, which is a consolidation of twenty-one locations, reached in places a width of nearly 200 feet, and the lean iron pyrites upon which the oxidized ores bottomed at the level of the bed of the gulch—here and above the true water level—is estimated at 3,000,000 to 5,000,000 tons. Out of the ridges bordering Bear Gulch, 60,000 to 70,000 tons of oxidized ores, which sold for $1,500,000 have been taken.

Still west of the Old Telegraph, in the Spanish, the mineralized zone is six hundred feet wide, the ore making in pipes and kidneys of all shapes and dimensions, but with a certain regularity of strike and dip. On the surface there was a vast body of oxidized ores.

The Jordan lies next west. At its intersection with the South Galena the oxidized ores of the surface worked out 100,000 tons, worth $2,000,000, and there now lies in the same vicinity 1,000,000 tons of $20 quartz, in which gold and silver are so combined that no way has yet been found to work it without a loss of the most of the one or the other metal. Four hundred thousand tons of similar material, bearing $8 and upwards per ton in gold and about the same in silver, constitute a hillside above the bed of Carr Fork on the Stewart property, a half or three-quarters of a mile north of the Jordan, believed by competent geologists to be part of the same deposit. On all this upper part of the mineral belt the snow fall is heavy. It melts slowly, sinking instead of running off, and the ground appears to be full of *water clear up to the* surface drainage. At all events, the surface drainage *is the line of division* between oxidized and base ores. The Jordan, the

Spanish, and the Old Telegraph, were paralyzed by the exhaustion of their oxidized ores, but as methods have improved, work has been resumed, and their output is yearly increasing, shipments comprising remnants of surface carbonates, generally requiring concentration, and galena, more or less mixed with iron pyrites, which has to be roasted, and in much of it the pyrites dressed out. All these mines have concentrating mills, in which, by a careful adjustment of jigs, screens and tables, determined or regulated by experimenting, galena and iron pyrites are obtained as separate products, cheaply and without great loss. The latter generally carries a fair proportion of the silver, and has a value as fluxing material.

As has been stated, the deepest workings in the Brooklyn, and the Yosemite, seem to indicate that the pyritous zone is less than 200 feet thick, galena predominating below, a galena twice as rich in silver as the surface carbonates and sulphates. If this proves to be the fact, it will lead to deeper workings on the upper part of the belt, where the ores appear to be in practically unlimited quantity. But if the pyrites persist to the deep, the future of the district must mainly depend upon the utilization in some manner of low-grade pyritous ores. To accomplish this, cheap and perfect ore dressing, saving of all the contents of value, cheaper transportation, cheaper fuel and cheaper labor, than are available at present, are indispensable conditions.

There are many productive and valuable mines in the district, aside from those mentioned, not on, or even near, the principal ore channel. Such are the Lucky Boy, the Silver Shield, the Live Pine, the Last Chance, the Nast, the Saturn, the Aladdin, the Alameda, the Dixon, the Winnamuck, and five times as many more. They seem, in general, to be steadily increasing, both in product and promise. None of them have been explored to any depth below water level. Most of them are worked by lessees, depend upon their product for development, and even for plant, and are necessarily worked with the greatest care and economy. Could this district—and this is equally true of all our mining districts—command means by assessment to outfit and open their mines systematically, as the Comstock mines could and did for twenty years, Utah mining would enter upon a new era, and our output would be doubled twice over.

Miners' wages in Bingham are $2.50 to $3.50 per day, lumber costs $26 per M, round timber 10 cents per running foot, and coal $10 a ton. Salt Lake County's total output of ores for 1887 was 30,384 tons.

## TOOELE COUNTY.

Shipments of ore from Tooele County for 1887, inclusive of about 130 tons run through the Pascoe smelter, and 450 tons from Bolter Springs Station, on the Salt Lake & Western Railway, were 7,850 tons. The mineral belt at Stockton strikes southerly along the foothills of the western slope of the Oquirrh Range, a little diagonally with the range itself, throwing it up toward the summit further south, as at Dry Canon, Ophir, and east of Bolter Springs Station. The belt is a mile or more in width. There appear to be two systems of veins at Stockton, one striking east and west, in which the main ore bodies make, the other, north and south, thinner, less persistent, and apparently feeders. The formation is quartzite and lime, underlaid by syenite. Granite porphyry dikes cross and disturb the veins. The gangue is oxide of iron, quartz, spath and clay. The ore is galena and carbonates, free from base metals and very desirable as a flux for dryer ores. The ore makes in well-defined pipes or chimneys, of which there may be five or six in the course of a thousand lineal feet. The water level is 700 or 800 feet below the surface. None of the mines appear to have gone below it, there being no necessity for it as yet.

At present the Honerine is the leading mine. A description of the Honerine will give a fair idea of mining in the district. It is held to be a bedded vein in magnesian limestone, crossed by dykes of porphyry and a series of thin fissure veins. It is equipped with steam hoist, and is opened to the water level, about 800 feet, by working incline and levels 100 feet apart. Only 3 per cent of the ore is shipped as mined. This is 64 per cent lead, and contains 34 ounces silver per ton, and a little gold. Ninety-seven tons out of 100 are run through jigs at a cost of $1 per ton, and dressed down to twenty-six tons of concentrates, which is 53 per cent lead, and contains 23 ounces silver per ton and $1 in gold. The mine has 20,000 tons in reserve, and a promise of ten times as much more in new ground now being opened by an adit 3,000 feet in length. Thirty-seven men are employed, at a perdiem wage of $2.50 to $3 each. Lumber costs $28 per M, round timbers 5 cents per running foot, wood $4 to $5.50 a cord. Shipments from the Honerine have run between 300 and 400 tons per month the past four years; dividends amounting to $125,000 have been paid; $37,000 in 1887.

Several incorporated companies and sundry individual miners are working and developing more or less promising properties, and the business and its returns are steadily increasing. There is a smelter on Rush Lake, two miles from the mines, for some years idle, recently rejuvenated, and getting into operation again. One reaches the district via the Utah & Nevada railway, which turns the Oquirrh Range on the shore of Great Salt Lake. The railway terminates on the north side of a sharp ridge, which is thrown clear across the valley about ten miles south of Great Salt Lake.

At Dry Canon and Ophir there is new and increasing life and activity. The Gem, at Ophir, is being opened by decline and tunnel to a depth of 700 feet. The ledge is a contact between limestone and slate shale, about twelve feet thick, fed by a series of stringers coming in from the footwall country. The ore makes in pipes, and can be selected to a very high grade. The Consolidated Mining Company is opening the Greyrock and Antelope by shaft and tunnel, to a depth of 600 feet. They have large bodies of ore ready for sloping, much of which require concentration to bring it to the shipping grade. The Brim Bros. and others are taking out ore in a small way on Lyon Hill. These districts were very lively fifteen years ago, but were abandoned for fields which appeared to offer greater inducements, as soon as the surface had been skinned. Improvements in methods, processes and appliances since that time, giving value to ore then worthless, is fast recalling attention to this section. It is very convenient to market, and will certainly be the scene of increasing activity in the future.

New mines are being opened a few miles northeast of Bolter Springs

Station, on the Salt Lake & Western Railway, ten or twelve miles north of Eureka. An adit at one place discloses a ledge of 33 per cent of lead ore more than twenty feet wide. The outcrop of this ledge is iron ore. The ore carries but little silver, although it improves in that respect with depth. There is here the promise of a new district. Mining on the slopes of the Oquirrh Range, from Stockton and Bingham to Tintic, is in a healthy state, the area is broadening, more money is being expended in improvements, prospecting and development, and the output increases in quality and amount from year to year.

## WASHINGTON COUNTY.

The zone of silver-bearing sandstone which crops out in the reef in Washington county is from 10 to 100 feet thick. It conforms to the stratification, dips 15 or 20 degrees from the horizontal, is overlaid by clay shale and red sandstone, and underlaid by white sandstone. Within this zone the pay-rock occurs in well-marked bodies or shoots, usually small in dimensions, but sometimes extending from 60 to 200 feet on the strike, and from 100 to 300 feet on the dip of the formation. These bodies or shoots may be separated by barren ground; oftener they are connected by irregular stringers of pay-rock. With the exception of where it is associated with the silicified remains of organic matter—reeds, rushes, trunks and limbs of trees—the pay-rock is plain sandstone, undistinguishable by the eye from the ordinary material of the reef. The silver is mainly in the form of chloride, and the rock contains on the average, 20 ounces per ton, 80 per cent of which is obtained by wet crushing and pan amalgamation with salt and bluestone. It is easily crushed, a five stamp mill reducing thirty to forty tons in twenty-four hours. The total cost of mining and milling is less than $15 a ton, perhaps as low as $13 per ton. The Christy and the Stormont companies, which divide between them the best of the ground so far as known, have with fifteen stamps, and pans in proportion, taken out 5,000,000 ounces of fine silver in the past ten years. The Stormont closed its mill about the first of January, 1887, and in July suspended operations. The mill is now leased and kept running on custom ores. The Stormont workings have not penetrated so far in depth as the Christy workings, which are both north and south of the Stormont, on the same zone. The Stormont property, so fertile above, can therefore hardly be exhausted. With 1887 the Christy Company completed an almost continuous run of ten years. Its property is worked the deepest of any in the district, and shows no signs of exhaustion. The company mines and mills 10,000 to 12,000 tons of rock each year. The output of the district for 1887 was 221,728 ounces of fine silver, most of which was the product of the Christy mill.

## TOTAL ORE PRODUCT FOR 1887.

The total output for the year by counties is as follows, to-wit:

| | |
|---|---|
| **Beaver County** | 5,369 tons |
| **Juab County** | 22,900 " |
| **Summit County** | 70,663 " |
| **Salt Lake County** | 30,384 " |
| **Tooele County** | 7,850 " |
| **Washington County** | 12,000 " |
| **Total** | 149,166 tons |

This is exclusive of about 10,500 tons of Tintic iron ore. As near as can be made out, this ore was reduced as follows:

| | |
|---|---|
| Ontario and Daly mills | 50,000 tons |
| Christy mill | 12,000 " |
| Northern Spy mill | 900 " |
| Salt Lake Smelters | 65,500 " |
| Total | 128,400 tons |

The remainder, 20,766 tons, was shipped out of the Territory for reduction, and this does not sum up all that was so shipped into 7,800 tons, since there were shipped abroad 28,751 tons. The 7,800 tons must probably be added to the product of the counties, as above stated, making the total ore product 156,971 tons.

## DIVIDENDS.

Dividends paid in 1887 amount to $1,267,500, to-wit: Ontario, $900,000; Daly, $300,000; Honerine, $37,500; Mammoth, $30,000. The profits of mines worked by individuals, of close corporations, and of smelters connected with foreign corporations, there are no means of ascertaining. The New York *Engineering and Mining Journal* reports $25,000 in dividends paid by the Brooklyn in 1887, which, if true, must be added to the above.

## COST OF EXTRACTION AND REDUCTION.

Cost of mining and reduction varies greatly with circumstances. At the Ontario it is something less than $30 per ton; at the Daly it is given at $26; at the Horn Silver in 1883-84 it was about $26. These figures include all cost for the year, maintenance of plant, dead work, incidental expenses, but not, of course, original cost of plant and opening of the mine. At Silver Reef, cost of mining and milling is $13 to $15. At the Crescent the past year the ores are charged with $19 per ton of shipping ores, $5 of which is on account of concentration. The mass of our low-grade ores—probably three-fourths of them—require concentration. Many of them have to be roasted, the lumps in out-door heaps, the fine in reverberating or revolving roasters. To the charge against the Crescent ores must be added $10 or $12 per ton transportation to smelters and smelting. The figures given are the cost figures of mines varying widely as to location, natural conditions—as dimensions of vein or ore bodies, water, distance from market, etc.,—grade and nature of ores, appliances and processes of reduction. But doubtless $30 per ton, amply covers the cost of extraction and reduction of all Utah ores.

## SAMPLING.

There are ten sampling mills in the Territory, one at the Horn Silver, one in Mr. Campbell's works at Milford, two at Park City, four at Sandy and *vicinity, and* two in Salt Lake City. Together they sampled the past year about *87,000 tons of ore. Ordinarily* only the fifth or tenth sack of a lot of ore is sampled, and the cost is $1 per ton for the whole of it. Where the whole is sampled the charge is $4 a ton. The sampler crushes the ore to the size of peas, thoroughly mixes, and sends sealed packages to the assayers, upon whose certificates it is bought and sold.

## SMELTING.

In the Jordan Valley, six to twelve miles south of Salt Lake City, on the railroads, are the Utah smelters, four or five different concerns, comprising about a dozen stacks. Those in blast at present, are the Germania, three stacks, three revolving roasters, and one large reverberatory; the Hanauer, three stacks, with crushing and roasting facilities, run by water power; the Mingo, four stacks and five reverberatories, the three plants valued at $400,000. Together they run six or seven stacks pretty steadily, employing about 270 men, at an average wage of $65 each per month. The past year they smelted 65,500 tons of silver-lead ores, and 34,000 tons of fluxing materials, consuming 27,000 tons of fuel, and running out 13,500 tons of lead bullion, worth in Salt Lake—lead, an average for the year of $50 a ton, and silver 94 cents an ounce, $178 per ton, $2,403,000. The items of cost were as follows;

| Article. | Tons. | Per Ton. | Total Value. |
|---|---|---|---|
| Iron ore | 9,513 | $ 4.50 | $42,809 |
| Limestone | 24,930 | 1.75 | 43,608 |
| Scrap iron | 60 | 6.00 | 360 |
| Colorado coke | 15,728 | 13.00 | 204,464 |
| Charcoal | 1,680 | 13.00 | 21,840 |
| Coal | 7,563 | 5.00 | 37,815 |
| Coal slack | 1 374 | 3.00 | 4,122 |
| Wood (cords) | 800 | 4.00 | 3,200 |
| Labor, 270 hands, $65 per month | | | 212,521 |
| Total | | | $570,739 |

About $8.70 per ton of ore smelted, $5.70 of all the material smelted. If their purchase of ores ran with their reduction—they paid for silver ores $1,778,500—they paid an average of $27 a ton, and realized about $37 a ton, $10 for the lead, $27 for the silver, Salt Lake price. Their outlay for ores, fluxing materials, fuel, and labor, sums up $2,339,239, leaving a profit of $63,761 in cash, besides a probable increase of stock, and perhaps something in furnace matter. The total transportation in connection with their business, as near as may be, was $140,000 tons an average distance of 300 miles.

## CONCLUSION.

Mining in Utah appears to be in a healthy and growing condition. The Southern mines are not as productive as formerly, just at present, but the Northern districts are more so.

Work is being resumed in some districts once practically abandoned. Mines are being discovered and opened outside of organized districts, and new railroads projected to give our Western mines an outlet. More money than formerly is being expended in the way of prospecting and development. From the strength of prices of metals, an increase in the value of our output may reasonably be expected, at the same time that its increase in amount is certain. Our mining field offers solid inducements to skill and enterprise backed by money. With these there can be no doubt that our mineral output might be doubled within two or three years.

## IRON AND COAL.

The ores of iron occur all over Utah Territory in great variety. There are beds of micaceous hematite sixty feet thick at Smithfield, Cache county. About Ogden occur deposits and ledges of various kinds of iron ores. On the Provo, below Kamas, on the Weber and in the Ogden canon; on the Wasatch, above Willard, and above Bountiful; in City Creek Canon, at Tintic, in the Cottonwoods, scattered over the desert, bursting out of the mountain slopes--in the North, the Center, the South, the East and the West--iron ores in all variety, save the spathic ores alone, are found. Many of the silver mines have a stratum of iron ore, carrying enough silver to make it valuable, aside from its use in fluxing silicious ores. In all of the eighty mining districts of Utah it is probable that iron ores are more plentiful than any other. Some of the more prominent and accessible deposits, have forced themselves into notice, but there will not be much definite knowledge, either of the quantity or quality of our iron ores, until somebody shall have established the business of iron-making in all its branches in Utah. Attempts have been made in this direction in Iron county, and at Ogden, but the conditions thus far have been such as precluded the possibility of success. For the purpose of fluxing silicious silver ores, the iron cropping out on the slope of the Wasatch, above Willard, some deposits in Morgan county, near the line of the Union Pacific, some in the Wah Wah Range, 25 miles southwest of Frisco, and the Iron county deposits, have been drawn on to a slight extent. The chief source of supply of the Sandy smelters, has been in Tintic Mining District, and occurs in a belt about 300 yards wide and 1½ miles long, striking northeast and southwest, lying on the mountain side sloping toward Dragon Hollow, which leads from Silver City upward to the summit of the Oquirrh Range. A hundred thousand tons has been quarried out of this belt in different places; the quarries may be 100 or 200 feet long, and carried into the hill 40 or 50 feet, gaining a breast in that distance 40 or 50 feet high. It is easily selected so as to yield 50 to 60 per cent. of iron, and it generally carries a little silver and gold.

## THE IRON COUNTY DEPOSITS.

The most important iron ore deposits known in Utah, are in Iron county, about 300 miles south of Salt Lake. The iron belt is two miles wide, and extends from three miles north of Iron Springs, southwesterly to within three miles of Iron City sixteen miles--crossing a spur thrown out northward from the Pine Valley Mountains, which rises perhaps 1,500 feet above the plain, and is called Iron Mountain. The southern end of the belt naturally gravitates toward Iron City, the northern end toward Iron Springs. The center of the belt for six miles, has but one prominent iron outcrop, called

"Desert Mound." The Iron Springs group of mines are all within three miles of Iron Springs, part on the northeast, part on the southwest. The Iron City group begins three miles northeast of Iron City, and extend four miles. These two groups and the Desert Mound include the entire outcrop of iron that is apparently worth taking up. They cover in all, some fifty claims or locations, and sum up, if patented 600 feet in width, including 240 acres of patented ground, about 1,000 acres. Probably one-fourth of them are not worth patenting. The country is granite and porphyry, with dykes of limestone, the latter important as a flux.

The ores are magnetite and hematite, and different outcrops have been tested sufficiently to satisfy Prof. Newberry, who had samples assayed at Columbia College, that they afford a practically unlimited quantity of fine Bessemer ore. Practical iron workers concur in saying that they are very remarkable deposits, whether considered with respect to quantity or quality. One said to the writer that they exceeded in extent, and apparently in quality the famous Iron Mountain and Pilot Knob deposits in Missouri. He could not compare them with the Lake Superior deposits, because he had never seen them. It is estimated that 3,000,000 tons may be seen in the "Blowout" alone, above the surface of the contiguous ground. Other deposits expose their million tons each, although but little effective development work has been done. There are probably 50,000,000 tons of iron ore embraced in these claims, above, and within easy reach, below the surface, Not all pure ore, but including many ledges or deposits, practically inexhaustible and of superlative quality, sufficient, without intermixture, save with each other, for the production of Bessemer iron and steel. Prof. Newberry says of them:

"The deposits of iron ore near Iron City and Iron Springs, in Southwestern Utah, are probably not excelled in intrinsic value by any in the world. The ore is magnetite and hematite, and occurs in a belt fifteen or twenty miles long and three or four miles wide, along which there are frequent outcrops, each of which shows a length and breadth of several hundred feet of compact massive ore of the richest quality. There are certainly no other such deposits of iron ore west of the Mississippi,and should it be found practicable to use Utah coal for the manufacture of pig and bar iron and steel from these ore beds, it would be difficult to overestimate the influence they would have on the industries of the Pacific Coast."

A letter published from Mr. Brittan, a prominent Philadelphia iron-master, says:

"Some time ago I analyzed a number of samples of iron ore and limestone from Southern Utah (it was from these mines), and have information as to the magnitude of the deposits. At first I was somewhat inclined to discredit the statements, but afterwards had them confirmed by a well-known English iron-master, who had himself visited the locality. I now hold the impression that these deposits are among the wonders of the world. If such coke as you sent me can be produced there in quantity, Utah's iron resources must exceed those of any other section in the Union."

The analyses spoken of were five, and were made for iron, phosphorus, and sulphur only. The average result was, of iron, 64 per cent.; of phosphorus, 12 per cent.; sulphur, practically none. Mr. W. A. Hodges, of Salt Lake, analyzed two samples—No. 1, of magnetite, No. 2, of hematite—for the writer, and obtained the following result:

| | Iron. | Phosphorus. | Sulphur. | Silica. |
|---|---|---|---|---|
| No. 1 | 62.60 | none. | .12 | 4.8 |
| No. 2 | 60.90 | none. | .08 | 5.7 |

Mr. Brittan analyzed a specimen of the limestone near Iron City, finding of carbonate of lime, 80.35 per cent., and of insoluble silicious matter, 10.92 per cent.

## WATER—FUEL—COAL.

There is but little surface water at Iron Springs or at Iron City, but good water in plenty can be got out of wells fifteen to thirty feet deep. At Cedar City, between the iron and coal deposits, there is plenty of running water for iron works of any possible magnitude. There is enough timber in the country to furnish charcoal at cheap rates for some years. There is coal in the vicinity of Iron City, but probably laid down in too small basins to be of much account. There is coal outcropping for fifteen miles in the face of, and near the top of, the Wasatch (called Cedar) Mountain, back of Cedar City (east), probably extending east, the Range here being a mesa (table-topped), ten to twenty miles. It has been coked on the ground, and, it is affirmed, answered well in the Horn Silver stacks at Frisco. Speaking to this point, Prof. Newberry says:

"Within fifteen miles of the iron ore beds, and separated from them by a nearly level plain, are deposits of coal which I believe can be successfully used for smelting iron, and which are certainly capable of furnishing a fuel that will perform all the other duties of coal, and that, in inexhaustible quantities. These coal beds are connected with the coal fields of Eastern Utah, but it is only here that they push through the mountains into the 'railroad valleys' which lie between the Wasatch and the Sierra Nevada. Several beds of coal here crop out on top of Cedar Mountain, beds which vary from 5 to 18 feet in thickness. The coal is of the Cretaceous Age, and equal in quality to any of the Western coals. It makes a fairly good coke, apparently as good as that manufactured at Trinidad, Colorado, and so extensively used for metallurgical purposes in that State. It is fully equal to the coals of Central and Northern Utah: hence it will probably furnish a fuel adapted for smelting and manufacturing iron."

## UTAH COAL FIELDS.

There is coking coal at Wales, in Saupete Valley, connecting via the Sanpete Valley Railway with the Utah Central at Nephi. A thousand tons were made there a few years ago, and sold to the Sandy smelters. But they had a poor plant for washing and coking, and too long a wagon-haul, and so could not make it a success, economically. The Sanpete Valley Railway Company own eight miles along the strike of a four-foot vein of coal pitching under a *heavy mountain*—*10,350 acres*—and they intend to set up the best possible coking plant and enter upon the manufacture of the article. Coke has also been made in Pleasant Valley, a great coal-field lying east of Sanpete Valley, and there is no doubt that selected coals of the great coal-field in Castle Valley, adjoining Pleasant Valley in the south, will make coal. Mr. Blodgett Brittan, the iron man before cited, gives the following analysis of the coal and the coke from it:

| | Coal. | Coke. |
|---|---|---|
| Volatile matter | 40.61 | 2.70 |
| Fixed carbon | 48.21 | 94.05 |
| Ash | 1.88 | 3.25 |

A. P. Bouton, M. E., reporting on the coal veins of Sanpete Valley, says: "The coal is of a dark brown color, highly stratified, as it naturally would be so near the surface, having been exposed for vast ages of time to the oxidizing forces of nature, carrying in the lines of fracture the scales of sulphate of lime, increasing the percentage of ash. These mineral salts must of necessity prevail here, being deposited by the water-carrying minerals in solution. The salts disappear very rapidly in going in on the veins, and in proportion as you get beyond the breciated rocks overlying the outcrop through which these mineral waters have been filtered. Samples obtained about forty feet in depth from the surface, by analysis yield as follows:

| | |
|---|---|
| Moisture | 1.8 |
| Bitumen | 34.2 |
| Coke, exclusive of ash | 50.7 |
| Ash | 13.3 |

This coal, by distillation, makes an excellent article of coke, having a fine metallic lustre, but it is a little lighter than that obtained from the Cumberland coals. In the manufacture of iron an efficient and ample supply of fuel is the great desideratum. With an estimated area of 20,000 square miles of coal lands, extending from the northern boundary of the Territory, to its southern border, there need be little or no apprehension of a deficiency of combustible material for some time to come."

The coal of Utah has a thickness of 165 feet, and lies mainly along the eastern slope of the Wasatch Range, from the Uintah Reservation, through Pleasant Valley, on Huntington Creek, in Castle Valley, and on down to Kanab and Pahreah, on the Colorado River. The formation may have been entirely carried off by erosion in considerable areas, but it was all originally coal-bearing, and thousands of square miles of it have not been eroded away. Central Utah finds access to this vast coal-field through Spanish Fork and Salina canons. The Denver & Rio Grande Western, now building between Salt Lake City and Denver, has already passed the Wasatch Range through Spanish Fork Canon, and a branch from Tucker to Scofield in Pleasant Valley, where the company owns several square miles of coal, is in operation, and delivering coal in Salt Lake Basin at the rate of 50,000 tons a year. Utah has bought within ten years 500,000 tons of Wyoming coal at a cost of nearly $4,000,000. She will henceforth save one-half at least on that score. The coal is a good brown coal, and the vein thick enough so that a train of box cars can be backed into them to be loaded. The same company has projected and begun a branch road from Grand River, through Salina Canon, into Central and Southern Utah. It is said that these roads are hardly out of sight of marketable coal banks from Gunisnon, Colorado, to Salt Lake Valley. There is good coal on the Weber River and its tributaries, for ten or fifteen miles above Echo. These beds have been wrought for fifteen years. Some of them are opened to a depth of 1,000 feet, and are well equipped with steam pumps and hoist. The mines about Park City draw their supply from these deposits. The coal is an excellent house and steam-making fuel.

## WILL IT PAY?

It has been said that "in order to justify an increase of the iron-making plant of the world, a place must be found where the materials for iron-production are plenty and contiguous to each other, where labor is intelligent and steady and reasonably cheap, where supplies are to had at ordinary rates, where there is an ample and accessible market at hand, and withal far enough away from the iron-making world of America and Europe, to defy competition." If there is such a place it is in Utah. The materials for iron-production occur in unlimited quantity in Iron county within 20 miles of each other. The railroad approaches to the Iron Mountain from all points, are easy, and when the roads already projected and in process of construction are completed, the whole Pacific Coast will be in direct communication with these mines, and they will have an outlet toward New Orleans as well. These roads comprise thousands of miles, and of themselves, with their indispensible branches and feeders, will make a hungry market for Bessemer iron and steel, and also insure competition in the transportation of materials and manufactured products. The Utah laborer is reliable, intelligent, steady, and is contented with lower wages than the same quality of labor commands elsewhere. Many of them were born and reared in the coal and iron districts of Great Britain, and are familiar with all branches of the iron making business. The staple foods for man and beast are more plentiful and cheaper and better than in most places, but such things as cannot be grown or manufactured in Utah are higher in price than at either seaboard or in the Mississippi Valley. Striking an average, however, it is safe to say that all needful supplies are to be had at ordinary rates. The product would need fear no competition nearer than St. Louis, 1,500 miles away. Colorado is not taken into account, because she lies east of the Mountains, and her iron ores will not suffice for more than her own wants. On the Pacific side we are protected by the duties on foreign iron and steel; on the east, by the cost of carriage over 1,500 miles of space, which, rated at twice the cost of transportation in New York State, would be $30 a ton. So far as known there is no coal of account north, south or west of Utah in the United States, and no iron ores occur at all compared to ours. With great works, thoroughly equipped for all branches of the business, it is therefore not easy to see why we may not justly count on having and holding the entire Pacific Slope for a market for our product. The query, "Will it pay?" must be answered in the affrmative.

## A CENTRAL LOCATION.

It might be good policy, however, to locate iron works more centrally as *regards the Territory,* than in Iron county. There are enough ores there to long outlast the fuel. There is coal there, and a good deal of it, but it is hardly true that it is inexhaustible, while it is substantially true of the coal fields in Central Utah, in Pleasant and Castle valleys. Commissioner Morrell (to Paris Exposition, 1878, Vol. 3, of Reports) says that nearly two-thirds of all the coal produced in Austro-Hungary in 1876 (8,000,000 tons) was lignite. "Until the present century," he says, "charcoal was the only fuel that was used, both in the furnaces, and in the refinery forges; but now wood, brown coal, or lignite, and coke, are also employed. Lignite is used with excellent results in blast and puddling furnaces in Styria. In parts of Bohemia, Moravia, and Austro Silesia, coal is scarce or impure, and lignite and wood are used." It seems that a great iron industry has been sustained in these countries for a long period, with lignite as its chief fuel. Colorado is building up an iron industry on the same fuel. Her lignites are no better than those of Utah. There is no reasonable doubt that our coal will answer every purpose in connection with the business.

As to the contiguity of the iron and coal, were iron works established on the Sevier River where the Utah Central Railway strikes it, about 100 miles south of Salt Lake City, they would have unlimited room and unappropriated water; they would be in the great farming section, and easily accessible from all quarters; they would be within 100 miles of the great central coal fields, and equidistant (180 miles) from the Iron county and Cache Valley iron deposits, the extremes on either hand. The average haul of materials could hardly exceed 100 miles. It would cost $4 to get the material for a ton of pig iron together, at that point allowing twice the actual cost of freight carriage in New York State. This is far less than the average cost in this country, where, as Mr. Lowthian Bell, M. P., says in his report to the British Government, "it may and does happen that distances of nearly 1,000 miles intervene between the iron ore and the coal:" and where, as Commissioner Morrell says, "nearly one-third the cost of all the finished iron and steel made, is created by unavoidable railroad transportation." This locality would be 600 to 800 or 900 miles only, from every live center of industry on the Pacific Slope, including San Francisco. Pig iron, made at this point, or at the point named above, could hardly cost more than $10 a ton, and at $1 per ton per 100 miles freight to San Francisco, say 900 miles, it could be delivered there $4 or $5 cheaper than the ordinary price there. The same or a greater difference in favor of Utah manufacture, would obtain for bar iron, which costs $60 a ton in Pittsburg, and $30 a ton freight to San Francisco. By the time works can be established, the railroads will be done, and there is an immediate and profitable market at our doors, which we can at once command. Of course, the conditions of the problem would not be materially changed by the location of the works at Salt Lake or Ogden.

## THE OGDEN IRON WORKS.

After many vicissitudes, the Ogden Iron Works have fallen into such hands as could utilize them if they desired. Mr. C. W. Scofield, a large stockholder in the Denver & Rio Grande Western, and Mr. Jones, an Eastern iron man of experience, have secured control of the property. They own thirty-three acres of land near the junction of the four railways entering Ogden, a 45-foot stack, with lift and hot-blast oven, rolls for railroad and bar-iron, lathes, drills, planers, and a full complement of tools for a machine shop. Pig iron, several kinds of rolled iron, and certain castings, such as ore used in the manufacture of stoves, etc., which now cost three times what they ought, should first be made. Charcoal will be used for fuel, then coke, and perhaps our brown coal—at least in part. They have no doubt that they can make a satisfactory coke from the Pleasant Valley coal. Good coke is made from coal with exactly the same constituents. We have imported, within ten years, 70,000 tons of coke at a cost of $1,800,000. He who succeeds in stopping this drain, will be well worthy of the laurel. The four great iron-producing districts of the United States are Pennsylvania, Michigan, Missouri, and Tennessee. There is nothing required but setting about it, to make Utah the fifth. It is older now than the iron country in Michigan is, which is exporting more than 2,000,000 tons of iron ore per year, worth at the furnaces $8 per ton, and worth at the mine dumps $3 per ton, or a total of $6,000,000. Michigan, it may be said, has a market for her ores. Utah has a market for the manufactured product, which is very much better. Pittsburg and Cleveland, and other places take Michigan's $6,000,000 worth of raw material, and, (providing the fuel,) of course, turn it into thirty or fifty millions. Utah can do all that herself, and it wants only iron men and iron men's money.

## OTHER MINERALS.

Sulphur is formed by the condensation of escaping sulphur fumes from volcanic laboratories. There are several beds of it in Utah, the most important of which is one in Millard county, fifteen miles from the route of the Utah Central Railroad. It covers nearly 300 acres, and of the many openings made by shaft and cut, none shows it to be less than twenty feet thick. At that depth the still active exhalations become intolerable. Some of it is .98 fine, but the averave is about .65, the sulphur beds of sicily being only .20. The commercial value of the Utah find is chiefly a question of transportation, and, as good shipments are being made, that point seems to be favorably settled. The present product is about one carload of refined sulphur daily. Rock salt, much of it almost perfectly pure, is mined in Salt Creek Canon and on the Sevier. The northern part of Utah abounds in salt springs, perpetually pouring into Salt Lake. The brine of Salt Lake is about 17 per cent. solid matter, and averaging the lake, 85 per cent. of this solid matter is salt. As the evaporation of this water proceeds, the glauber and epsom salts naturally separate from the common salt, so that much of the article manufactured is .97 fine. The sun makes thousands of tons every season, as the annual spring tide of the lake recedes from its ragged and shelving shores, most of which is left to be re-absorbed by the yearly returning waters—there being no adequate demand for it. About 25,000 tons a year are used, chiefly in chloridizing silver ores. For this purpose it is sent into adjoining *territories to a large* extent. The price in Salt Lake City of the crude article is three or four dollars a ton. A good salt for table and household use is manufactured from the sun and shore product of Salt Lake.

Gypsum, both in the crystalized and oxidized state, is very plentiful in Utah, the most noticeable beds or ledges being in Sanpete county, above Cove Creek, on the Muddy, and especially near Nephi. There is a vertical ledge of gypsum just back of Nephi, 100 feet wide and 1,200 feet long, enough to supply all possible demand in the Rocky Mountains to the end of time.

In connection with the iron ore beds, the red and yellow ochres abound and are widely disseminated. In the Salt Lake Museum there are numerous samples of lead, iron, and chrome pigments, Venetian red, fire-proof paints, chrome yellow and green, and white and red lead, made from native ochres and lead. A Salt Lake company manufactures a fine article of white lead and paints from these materials to supply the home demand. In the shale beds, (underlying which, in strata not exceeding twelve inches in thickness), occurs what is called "mineral wax," appear to extend over an area of a thousand square miles, and to be from sixty to one hundred feet thick, and the part rich in gas and paraffine oils twenty to forty feet thick, with occasional thin seams of coal. They are cut across and exposed by Spanish Fork Canon, and are similar in general characteristics to the wax-bearing beds of Galicia, in Austria. These shales have been tested and are rich enough to justify distillation. Thorough prospecting with oil-well tools might develop a new petroleum district. The Promontory Range, which projects thirty miles into Great Salt Lake from the north, bears vast beds of alum shales, and a similar formation is met with in Sanpete county, on the Sevier, while alum, in combination with other minerals, is found almost everywhere, and has not been put to any use as yet.

Various kinds of soluble salts, appearing generally in shales or as a surface efforescence, (sometimes several inches in thickness,) are found in different localities in Utah. Near Independence Rock, (Emigration Canon,) the carbonate of soda exuding from the ground, was used by the first immigrants in making bread, and it answered very well. On the Salt Desert, west of Great Salt Lake, there are great quantities of saleratus, and in many places in the south there are shales and beds of exuded salts, thick and extensive enough to justify more attention than the subject seems to have received.

Much of the Tintic and other iron ores used in fluxing lead ores, and supposed to be from 50 to 60 per cent. iron, is really about 40 per cent. iron and 20 per cent. manganese. This kind of ore is especially valuable in making Bessemer steel. There are veins of sulphuret of antimony, three to six feet thick, near Bingham City, averaging for the entire vein matter 20 to 30 per cent. antimony, some of it assaying twice as high. Once separated from the gangue, the antimony could be smelted with raw coal as cheaply as pig lead, and the separation might be accomplished by mechanical means. Antimony is worth eleven to twelve cents per pound. Mica abounds in Southern Utah, and in the range separating Weber from Salt Lake Valley, being exposed in City Creek and Farmington canons. None of it in sufficiently large flakes to be of commercial value, however, has as yet been brought to light, but doubtless it would be, were some one with means to set about it persistently. Clay of all varieties, such as brick-clays, clays for fire-brick, fatty clays, potter's clays, and porcelain clays, (or kaolins), are found in Utah in different places west of Utah Lake, in Beaver and Sevier, and Davis counties, and in many of the mines. The deposits west of Utah Lake, near Lehi, are quite remarkable, both as to quantity and quality. Fire-brick is made from clay at Bingham Canon, while in the Frisco Mining District there is a fire-stone which has superseded fire-brick for furnaces in that vicinity. It is soft and can be cut like soap-stone, is in unlimited quantities, and hardens on exposure to the fire. Copper is found in nearly all of the mining districts of Utah. Tintic, Big Cottonwood, Snake District, and Beaver county are full of it. There are copper veins in Bingham Canon and on Antelope Island in Great Salt Lake, and outbursts of very rich copper ores in the sandstone country of the Colorado. It generally occurs in connection with other metals. If the matting of copper-silver-gold ores, just introduced by Mr. W. H. H. Bowers, at the Crimson Mammoth works, in Tintic, proves an economic success, it will be adopted in other localities, and an important addition made to the mineral output. Mineral discovery, and especially metallurgy, are as yet in the first stages of infancy in Utah. Nothing has been sought after but the precious metals, and incidentally, their almost universal matrix, lead. No one knows the number of the rare minerals available for commerce in the ores of the Territory to say nothing of those still unearthed, the search for which has comparatively but just begun. Gold, silver, lead, copper, iron, coal, zinc, antimony, arsenic, sulphur, and salt are common and plentiful enough; but cinnabar, bismuth, cobalt, molybdenum, and many others, are known to exist. Bismuth, both at Tintic and in Beaver county, exist, it is believed, in quantity and of a quality to be profitably worked.

Of building stone, there is scattered all over Utah, and very accessible, every variety, an inexhaustible supply. Among these varieties the best known are the granite, from the mouth of Little Cottonwood Canon; the true red sandstone of Red Buttes, near Salt Lake City, and the white secondary sandstone or oolite of Sanpete county. At Logan, an easily quarried square-breaking limestone, impregnated with iron, is largely used for buildings. Marbles, black, banded, variegated, cream-colored, gray, and white, all susceptible of a fair and some of them of a fine polish, are found at various points, as on the islands in Great Salt Lake, at Logan, Alpine City, Dry Canon, on the Provo, at Frisco, and at Tooele City. The Logan marbles are beginning to be used for slabs, furniture, mantel-pieces, etc. Antelope Island affords the best and largest slate quarry in Utah, so far as known. It is unlimited in quantity, green and royal purple in color, and is of as good quality as any slate of commerce, much better, indeed, for roofing, sinks, or billiard tables than the slate imported from the East. Fossils of the silurian, devonion, lower and upper carboniferous, permian, cretaceous, and lower and upper tertiary formations abound in Utah, and specimens of them as well as of petrified woods, volcanic products, obsidian glasses, and magnetic *sand, may be seen at the* Salt Lake Museum.

The deposits of asphaltum in Spanish Fork Canon rank among the most valuable of Utah resources. Nature has filtered it to the highest degree of purity, all that is required being the simple act of separation from a silicious combination. This, however, has been considered a difficult process under the conditions that usually prevail in such deposits, and a company has commenced the erection of a $40,000 plant of machinery to overcome the trouble. The process has been tested, and the success of this important industry seems assured.

## MANUFACTURES.

The manufacturing interests are in a very healthy condition. In fact, it is doubtful whether any of the surrounding states or territories can make as good a showing in this line, according to population and wealth, as Utah. Hon. Caleb W. West, Governor of Utah, in his 1887 report to the Secretary of the Interior, furnishes the following details of this important industry.

The aggregate value of the manufactured products of the Territory amounts to $8,726,500, giving employment to 3,573 persons, and capital amounting to $4,468,350, briefly detailed as follows;

*Wood Working Industries.*—Utah has eight factories engaged in making sash, doors, and blinds; five in making moulding, sixteen in furniture, seven in trunks and valises, two in making packing cases (besides two engaged in making paper boxes), five fence factories, having aggregated capital invested of $353,000, employing 475 hands, and producing $540,000 annually.

*Soap* —There is but one soap factory in the Territory, and that is in Salt Lake City, having $35,000 capital, and six employes, producing $55,000 worth of laundry and toilet soaps.

*Metal Workers.*—This industry, including plumbing, tinning, roofing, and the manufacture of tin and sheet metal ware, employs $130,000 capital and 165 workmen, and produces $320,000 worth of work.

*Foundries and Boiler Works.*—Including brass foundries, iron cresting, and machine shops, Utah employs $281,000 capital, 130 artisans, and produces $300,000 worth of work.

*Breweries.*—Utah beer is one of the most important industries we have, and that made in Salt Lake City bears a high reputation wherever introduced. The largest of these breweries makes 20,000 barrels of beer per annum, and bottles 600 dozen per day, of which 500 dozen are exported. The total capital invested in this industry in the Territory will reach half a million dollars, and the value of the products for the fiscal year ending June 30, 1887, is $313,192.

*Cigars.*—Until recently the manufacture of cigars has been confined to one concern only, but this industry, in common with most others here, has increased to such an extent that two other factories have been added. Only the high grades of cigars are made, and the returns for the past year amounted to about $200,000. It is demonstrated that our climate is very favorable to the manufacture of fine cigars, and I am told that the number manufactured will be doubled in the current year.

*Tanneries.*—Of the few tanneries in Utah the largest is in Salt Lake, employing fifteen hands, and producing nearly $75,000 worth of leather annually. This is chiefly sole leather, for use in the shoe factories here, of which they turn out 180 sides per week, requiring an importation for this purpose of 500 cords of California oak bark. Only the want of native bark prevents tanning from becoming a large industry in our midst.

*Clothing.*—The most important clothing factory in this Territory is that of the Z. C. M. I., in Salt Lake, which manufactures twenty-five dozen garments per day, chiefly men's overalls and underwear. The value of this product is $50,000 per year. Forty-two hands are employed and thirty machines run by power, and here are the only steam cutting machines used in the Western region. A smaller concern in Provo turns out considerable work, using principally the cloth made by the large woolen mill there. A thriving business is done in merchant tailoring here and in other large towns, and of such good quality that orders are received from long distances.

*Flouring Mills.*—There are in Utah 120 flouring mills, ten of which are roller, or new process. The product of the best of these is not excelled in quality by any in America. The aggregate capital invested in this industry is $1,375,000; the annual product is 109,840,000 pounds of mill stuffs, valued at $2,288,000. Such is the extent of our flouring interests that nearly all of these mills are in operation the year round. In addition to these there are mills for the manufacture of oatmeal, rolled oats, cracked wheat, hominy, pearled barley, and other farinaceous goods.

*Knitting Factories.*—There are five large, and a number of small knitting factories in the Territory, employing over a hundred operatives in the manufacture of hosiery, bathing suits, underwear, hoods, leggings, mittens, jackets, etc., using native material almost entirely, and exporting 50 per cent. of their $75,000 product.

*Silk Manufacture.*—About ten looms are successfully employed for the making of silk goods, chiefly handkerchiefs, with a capital of $1,000, employing ten hands, importing their own raw material, and turning out goods to the value of $5,000.

*Boots and Shoes.*—This industry gives employment to 350 persons in various parts of the Territory, by far the largest concerns being in Salt Lake City, where two factories alone employ 200 hands and turn out excellent goods to the amount of $250,000. One of these factories is the largest west of Chicago. The goods are sold in Idaho, Montana, Wyoming, and Colorado, as well as in Utah. The number of pairs annually produced in the Territory is estimated at 200,000, valued at $350,000.

*Woolen Mills.*—There are eight woolen mills in the Territory—the largest being at Provo, with a capacity of 1,000 yards per day. The others are at Salt Lake, Washington, Springville, Brigham City, Ogden, Kingston, Beaver, and West Jordan. Their aggregate capacity is 600,000 yards of stuffs per annum, and 40,000 pounds of yarn, besides a considerable quantity of blankets. In this work they consume 100,000,000 pounds of native wool, and 5,000 *pounds of* native cotton, grown in southern Utah. The combined investment in these factories amounts to $400,000, yielding profits of from 7 to 10 per cent., and giving employment to 400 operatives. The total value of these manufactured products is $375,000. They consist of choice flannels, linseys, cassimeres, doeskins, jeans, shirtings, blankets, carriage robes, tablecloths, batting, and yarns, fully one-half of which is exported, the balance finding a market in Denver, Chicago and other eastern points.

*Cured Meats.*—This is a growing industry in Utah, for which it is difficult to secure figures. From the data at hand it is safe to say that there is certainly $300,000 worth produced, involving but little capital, as the product is mostly home cured.

*Printing and Publishing.*—Including book binding and paper ruling, this involves a capital of $316,000, employing 187 persons, and turning out $443,000 worth of work.

*Aerated Waters.*—The several concerns engaged in this industry require a capital of $75,000, giving employment to 125 hands. The Idanha water of Soda Springs, Idaho, is a Utah enterprise, and of this alone some 5,000 bottles per day are packed in the busy season, and distributed throughout the United States, the aggregate value being $130,000 annually.

*Harness and Saddlery.*—This is an important industry in Utah, having an invested capital of $200,000, employing 185 skilled workmen, and producing $385,000.

*Crackers and Confectionery.*—Invested capital, $76,000; number of employes, 145; value of product, $252,000.

*Brick and Pottery.*—There are some seventy-five firms engaged in these industries, employing $123,000 capital, 630 hands, and turning out $234,000 worth of manufactured material.

*Paper.*—A large paper mill near Salt Lake City, employing twenty-five hands, produces annually about $40,000 worth of paper. Of this the greater part is print paper, such as is used for newspapers, and nearly all of the publications in Utah could be printed on the product of this mill. Manilla wrapping of various weights and qualities, brown wrapping and butcher's straw paper are also manufactured. Some large contracts for fine white and toned book papers and cover and flat papers, have also been filled. The buildings are situated at the mouth of Big Cottonwood Canon, near a splendid spring of crystal water, and are solidly constructed of granite. Some $140,000 is invested in this enterprise.

*Butter and Cheese.*—Of these important staples the estimated manufacture is $620,000 worth of butter, and $12,000 worth of cheese.

*Timber Interests.*—From reports available, I find there are 15,000,000 feet of lumber cut in the Territory, which at an average price of $25 per thousand feet, realizes $375,000. In addition to this there is cut for fences, mining timbers, and fuel, additional timber to the value of $125,000 annually.

*Salt.*—Some 30,000 tons of salt are annually sold, at an average price of $3 for crude coarse, and $8 for refined table. The coarse salt, as taken from the evaporating ponds on the shores of the Great Salt Lake, is suitable for the chloridizing of ores, and it is in this form that the greater part of the salt is exported. This industry produces a net revenue to the Territory of some $150,000 per annum, and furnishes employment to 150 men.

*Sundry Industries.*—In addition to the activities itemized above, there is carried on throughout the Territory the manufacture of vinegar, pickles, glue, paints, charcoal, lime, cements, brooms, brushes, showcases, bottles, baskets, blasting powder, picture frames, plaster of Paris, hats and caps, millinery, jewelery, and wire work. There are also chemical works, canneries, marble works, and concerns for the packing of fresh fruits, weaving of carpets, engraving, and the putting up of patent medicines. These sundry industries have a total capital of $281,350, employ 563 persons, and turn out products valued at $988,500.

There is not much to be said in favor of manufacturing in a new country, unless from materials native to it. Utah is as poor in valuable woods as it is rich in climate, soil, water-power, and minerals, the treasures of the last three being as inexhaustible as the pleasures of the climate. Below are indicated certain branches of manufacturing industry which it is believed offer the greatest inducements to engage therein. It should be borne in mind that while in some cases there is the cost of carriage both ways, (out and back,) and always one way in favor of the Utah manufacturer; that there is no limit to the water power running to waste in a score of mountain canons, that can easily be utilized. On the other hand, much depends on the coking qualities of the Utah coals. It may, perhaps, be conceded that coke is made from some of them of sufficient consistency to bear the charges in the lead smelters, but not, as yet, to bear the heavy weight of the charges in pig iron smelting. Although the coal fields are of great extent, they have been but slightly exploited, and beds that will respond to the utmost that can be asked in a coking coal may be found as well in Utah as in Colorado, the difference between coals being simply that of age and pressure under the application of heat. Coal of later age than the true coal formation, may make the best of coke, as has been experimentally proved at Trinidad, Colorado, and no doubt the supply will ultimately respond to the demand. In Utah's broken up coal fields it would be curious if somewhere the beds have not been subjected to sufficient pressure to make a good coking coal.

With the proper fuel, it is believed that the country west of the Missouri River does not afford a fuel for the manufacture of iron at all comparable to that lying unoccupied in Utah. There is a great variety of rich and remarkably pure iron ores, in proximity to the requisite fuel and fluxes; cheap labor, provisions and supplies; a central location and ample railroad inter-communication; a climate never interfering with operations in the open air; a large demand, and a freight tariff of from $20 to $40 a ton for the manufacturer's protection if it must be shipped away to find a market, to pay the cost of shipment, all of which combined, present unequalled inducements for large and remunerative plants. The materials and facilities are such as to justify such an enterprise on a large scale, not the manufacture of pig-iron solely, but of all kinds of merchant and railroad iron and steel, and of all railroad, mill, mining and smelting machinery. Under the circumstances it would seem that at least 1 per cent. of the one hundred millions invested in the iron business in the East might be profitably transferred to Utah.

Metallurgical works equal in capacity and variety of appliances to any in the world, should be established in Salt Lake Valley. Ores from adjoining Territories now find their way in considerable quantity to the Salt Lake Valley market. All ores not yielding readily to the lead smelting process employed here are rejected, and nothing is saved in the treatment but gold, lead, and silver, with sometimes a trifle of copper. With an establishment possessing the skill and means needed to separate all of the metals from their gangues and bases, whether chemically or mechanically combined therewith, or with each other, an incalculable stimulus would be given to mining. A great part of the ores of this whole region are neglected entirely, for want of the capital and skill to make any profitable use of them. Labor and materials may be cheaper in Europe, and Swansea may be, from its seaside location, the ore-reducing market of the round world; but our ores are far richer in metals as a rule than those of Europe, and the Rocky Mountains, easily accessible from Salt Lake Valley, are capable of producing a greater quantity and more various ores, if put to the test, than all the world beside has been furnishing. There can be no possible question as to the supply of ores in Utah, or their variety and richness.

In connection with works for the treatment of ores there should be establishments for the manufacture of drugs and chemicals, oils, paints, and all the artificial products of lead, beside the rifining of lead itself, and the making of pig and sheet lead, shot, lead pipe, etc. The materials for almost everything in this line are here in profusion. As a writer, who had traversed Utah, with an observant eye, has said: "The entire basin is a vast laboratory of nature, where all the primitive processes have been carried out on a scale so vast as to make man's dominion, at first sight, seem forever impossible." We now send our crude lead bullion east, and bring back pig and and sheet lead; lead pipe, white and red lead, and Venice white, instead of refining and manufacturing here and thus saving one if not two freight charges across the continent, such freight charges swallowing up one-third the value of the product. Even bluestone, used in amalgamating silver, is imported, with millions of tons of sulphur in sight, and the hills full of copper ores. And this is the practice in everything.

All the products of our fine clays and silicious sands--(pottery, fire-brick and glass), and of our marble and slate beds—(roofing, sink bottoms, table and bureau tops, mantle-pieces and billiard tables,) might be made here, as well as elsewhere. It has been shown that the manufacture of leather, boots and shoes, harness and saddlery, is by no means overdone; while in the working up of our wool crop, there is ample room and encouragement. The bad habit prevails of sending our hides and wools (the same as lead bullion) abroad to be manufactured and returned, thus involving payment for two carriages across the country when any carriage at all is superfluous. A start has been made in the manufacture of paper, but the single mill in operation makes only about one-tenth of the amount used. Some attention has been *given to silk*-raising, and silk-spinning machinery is beginning to be intro*duced.* The worms and the mulberry trees both seem to do well in Utah, and there is no apparent reason why silk-raising and manufacture should not grow into an important industry. The mention of some of these branches of manufactures may appear to be small matters; but it is a new country, and they are the beginnings of a larger growth. The scientific treatment of ores, however, and the manufacture of chemicals, paints, pottery, glass, lead, iron, copper, and woolen fabrics are believed to offer fair inducements to the skillful and enterprising investor.

## RAILROADS AND TRANSPORTATION.

The settlements of Utah occupy a belt from ten to fifty miles in width in valleys on the western slope and at the base of the Wasatch Range, extending the entire length of the Territory from Franklin on the north to St. George on the south. There is what is called the State Road running through the principal settlements from Salt Lake City to St. George, and it is continued, though not under that name, from Salt Lake City northward to Soda Springs, in Idaho. Off from this lead the roads to the side valleys, through the canons, as through Logan Canon into Bear Lake Valley; up the Weber, through Morgan, into Summit, and thence down Parley's Cañon, or the Provo River, into Salt Lake Valley again; up Ogden River through Huntsville and on over rolling country into Cache or Bear Lake valleys; up Nephi Canon into Sanpete county, down the Sanpitch to the Sevier, and up and down that river its whole length; and westward from Salt Lake City via the old overland stage route through Tooele and Skull valleys to Deep Creek, to Eureka, Austin, and Carson, in Nevada. The country generally offers no obstruction to road-making by simply driving in one track except in the canons. On many of the streams, even in the mountains, but little work is needed to make delightful carriage roads. In those canons offering no passes over or through into other valleys watered by different streams, penetrated solely for timber or mines, the roads are rough and steep, and it is only by much labor that they were made or are kept passable. While in many places the country roads are hard and usually pleasant, as a rule they are, from the nature of the soil, very muddy in wet, and very dusty in dry weather. There are about 600 miles of Territorial roads and 3,000 miles of country roads in the Territory.

This system of inter-communication by wagon roads is being rapidly superseded by a railroad system, whose general features consist of a main north-and-south road through the settlements from end to end of the Territory, and continuing on until they intersect the northern and southern transcontinental roads or find the ocean independently, with branches into the *mining canons and coal* fields, all connected with the general railroad system *of the country by* the Union Pacific and the Southern Pacific, and by *the Denver & Rio Grande* Western.

The railway-mileage of Utah, at the close of 1887, consisted of 598 miles of standard gauge, and 542 miles of narrow gauge track, exclusive of sidings, the total being 1,140 miles, which is divided up as follows:

| ROAD. | FROM | TO | Miles of line. | |
|---|---|---|---|---|
| | | | Gauge 4 ft 8½ inches. | Gauge 3 feet |
| Union Pacific: | | | | |
| Main line in Utah | Ogden | Wyoming line | 73 | |
| Utah Central | Ogden | Frisco | 280 | |
| Salt Lake & Western | Lehi | Silver City | 57 | |
| Echo & Park City | Echo | Park City | 31 | |
| Utah & Nevada | Salt Lake City | Terminus | | 37 |
| Utah & Northern* | Ogden | Idaho line | | 76 |
| Utah & Eastern | Coalville | Park City | | 27 |
| Total Union Pacific | | | 441 | |
| Denver & Rio Grande Western: | | | | |
| Main line in Utah | Colorado line | Ogden | | 310 1-10 |
| Bingham Branch | Bingham Junction | Bingham | | 16 3-10 |
| Little Cottonwood | Bingham Junction | Alta | | 18 2-18 |
| Pleasant Valley | Pleasant Valley Junction | Coal mines | | 17 3-10 |
| Coal mines | | | | 6 1-10 |
| Total Denver & RioGrande West'n | | | | 368 |
| Southern Pacific in Utah | Ogden | Nevada line. | 157 | |
| San Pete Valley | Nephi | Chester | | 34 |
| Grand total | | | 598 | 542 |

*Total length Ogden to Silver Bow, 410 miles.

The main continental railroad between the two oceans traverses the entire breadth of the northern part of the Territory, the two roads constituting the line joining tracks at Ogden, giving Utah important advantages from the competition between East and West. To come to details:

## THE UNION PACIFIC

Is the great road in Utah to-day. As will be seen by accompanying map, the system embraces over 5,000 miles of road, consisting of the main line, 1,037 miles long, and 4,000 miles of branches, exploring all parts of Nebraska and Colorado, extending in this valley from Milford on the South to Butte, Montana, 700 miles, and by the Oregon Short Line penetrating the heart of Idaho, and reaching the great and ultimate Northwest, where rolls the Columbia. The extent, variety, and importance of the resources of all this vast region, opened up to the world by this great road, is illustrated by the fact that where a few ox trains and a daily stage line twenty years ago, supplied its transportation facilities, it now pays tens of thousands of dollars a day for these indispensables. It is not within the scope of this review to dwell on the resources of sister commonwealths, but it may be said of Idaho that she is truly the "Gem of the Mountains," as the name is interpreted.

She has revealed a wealth of ore in the last five years which has startled the mining world, and will place her in the front rank as a mining State. The Wood River and Salmon River Regions are now attracting most attention, but their prosperity has not yet fairly begun. Fertile valleys, timber-crowned mountains, broad stock ranges, delightful resorts for tourists, and an unsurpassed climate, are Idaho's additional attractions and resources. The Union Pacific Oregon Short Line, and the Utah & Northarn Division cross the Territory at right angles. All here said extolling Idaho might be repeated respecting Montana, and then the half not be told. The Utah & Northern has had a marvelously magical effect on that magnificent Territory. Immediately it was constructed, the Union Pacific, in pursuance of its settled policy, placed before the world an attractive exhibit of her resources and attractions, to which she responded by doubling her population, wealth, and production in two years. With her rich and varied mineral treasures, vast stretches of natural pasturage, fertile farming lands, and healthful climate, Montana is a most attractive, and, at the same time, practically a virgin field for capital, pluck, and industry. The Union Pacific Railway system affords transportation facilities for this great inter-mountain region. It is pushing its iron way into all the valleys and over all the mountains to the trade and mining centers, assisting in every way their development. Among these most important extensions is

## THE UTAH & NORTHERN.

This branch of the Union Pacific starts from Ogden. It runs along the base of the Wasatch, about forty-five miles, crosses a low summit into Cache Valley, strikes across eastward to Logan, then North to Franklin, just over the Idaho line; then it escapes from Cache valley, and descends the Portneuf to Snake River. It is the only means of access to Northern Utah, and with the Oregon Short Line, to Southern Idaho, the sands of whose principal river for 200 miles in length, contain gold enough to make placer mining profitable. Its valley, which is very broad, will some day be a natural wheat field, second only to that of the Red River of the North. The road is intersected on the Portneuf by the Oregon Short Line. They run together down the Portneuf, and part company as they enter Snake River Valley, the Utah & Northern continuing on to Butte, Montana, 420 miles, and thence to the Northern Pacific, at Garrison, some forty-five miles further. Seventy-five miles of it are in Utah, and for a goodly part of the distance it runs through a garden.

## THE UTAH CENTRAL.

The Union Pacific owns a controlling interest in this road, yet a good block of the stock is held by Utah men, and it is managed by Utah men, John Sharp being Superintendent, and James Sharp, Assistant Superintendent. The road extends from Ogden south along the base of the Wasatch, through Kaysville, Farmington, Centerville, Bountiful, Salt Lake City, Sandy, Draper, Lehi, American Fork, Battle Creek, Provo, Springville, Spanish Fork, Payson, Santaquin, Nephi, and Juab, to Milford, in Beaver River Valley, with a branch to Frisco, fifteen miles—in all 280 miles. From Ogden to Juab is the best part of Utah. After leaving Juab, the road soon strikes the Sevier River, and following it, passes out through the Oquirrh Range on the desert. It is a desert now, but it is underlaid by a stream or reservoir of sweet water, and because it can, for the most part, be made a garden, it ultimately will be. Meanwhile, the Sevier River and Clear Lake Springs can be made to irrigate a broad area above and below Deseret. The road is stocked at $4,225,000, in 42,250 shares, and bonded for $4,900,000, all bearing 7 per cent. interest. The fixed charges are $343,000. It will be noticed that it is very lightly loaded with liabilities. It can earn its fixed charges, 7 per cent. on the stock, and carry a handsome sum to surplus or construction account beside. The company contemplate building a branch road through Spanish Fork Canon to Pleasant Valley, where they own several square miles of coal; also an early extension of the line to Iron Mountain, from Milford, fifty or sixty miles. From that point, the projected California line will give an outlet to Los Angeles and San Francisco.

The land along the Utah Central is good, and, where it can be watered, well tilled. The towns are embowered in trees. From Ogden to Salt Lake City the scenery is interesting. On the one hand is the Great Salt Lake, with its desolate islands and lifeless water, full, somehow, of mystery, in spite of all the learned explanations; on the other, the Wasatch Mountains, rising abruptly to the region of cloud and storm, ever changing in form and outline as one passes by—varying shade, and light, and hue, gorge, and crag, and cliff, and towering peak, rapidly succeeding each other. But it is idle to attempt to analyze the perpetual fascination of this combination of lake and mountain, orchard, town, and garden. It was of this route in part that the following was written:

"Coming down from Idaho in early May, our train entered this valley, and a scene as of enchantment at the same time. It was about the hour of sunrise. The sky was without a cloud, a vast dome of pearl high-arching over all. The air was the perfumed breath of the early morning and the young spring. Nothing could be fresher, sweeter. The dew hung in jeweled drops from the grass blades, and seemed to tremble on the eyelashes of the flowers. Our way lay through vineyards, and orchards, farms, gardens and villages. Brooks tumbled down the mountains, ran along by our side, and then sped away into the lake. The farmers were driving afield, to their plowing and sowing. The grass and fall wheat could almost wave in the slight breeze; the birds made the meadows and hedges vocal with their morning matins; plums and peaches in full bloom were sprinkled upon the whole country side, like flowering shrubs in a park; the tender young foliage of the larger trees seemed to caress the eye that rested upon it. But, in this heart of spring, winter was not far away. Mountains held high their white heads behind us; they towered at our side—an endless snowfield, unrelieved for long stretches by a single dark object—whiter than anything else on earth, and beautiful with a beauty which I can find no words to contain or convey. So near, too, it seemed you could put your hand on them. Once in a while a turn in the road would disclose a new horizon of snow caps, high in the upper air, still and solemn, glistening against the sun, almost taking your breath at first sight. A hundred miles of this brought us into Salt Lake, and here these monarchs of old, with white shoulders and foreheads, encompassed us around, save in the direction of Antelope Island, and I fancied, appeared not uninterested spectators, while spring created a new world at their feet, from which she would soon climb their steep sides, and give them vestments of flowers for their robes of snow. There was never a lovelier scene, and the ride might have extended a second hundred miles without running out of it. It was the utmost glory of spring and of winter, that is to say, of life and of death, placed along side by the simple device of a sharp and great difference of altitude. Nowhere else can it be seen to such advantage, in America, at least, and it is on exhibition here a month in every year. The spring is indeed lovely in Utah, and these well-watered, well-tilled valleys are none the less a delight and a relief as the season wears on to its height and descends to its close. The effect is enhanced tenfold by their setting in the heart of a thousand-mile desert, full of valleys and jornadas of death, and incapable of being transformed into another Utah, from lack of water."

## THE SALT LAKE & WESTERN.

This road leaves the Utah Central at Lehi, thirty-one miles south of Salt Lake City, and runs to Tanner's Springs, in Tintic Mining District, fifty-five miles. It is owned by the Union Pacific, and was intended to penetrate Western Utah, and cross the States of California and Nevada, to the Pacific. The proposed route is through the best mining region in the United States, one that has for years turned out, under every disadvantage, ten millions in bullion, yearly. When, if ever, the design of the organization will be executed in full, it is impossible to say. It would furnish an outlet badly needed by Salt Lake City and also by Nevada.

## SANPETE VALLEY RAILWAY.

This road leaves the Utah Central at Nephi, passes into Sanpete Valley through Salt Creek Canon, and thence southward to the Wales coal mines, twenty-eight miles. It was constructed by the English company owning these mines as an outlet for their product. A second company has been organized, called the California Short Line, for its extension southward to Salina, on the Sevier, and northward to a connection with the Denver & Rio Grande Western, at Springville. Sanpete Valley is one of the largest and best in Utah. The Sevier River is lined with settlements, and in the fine country on its headwaters are the Marysvale mines. The road will stimulate all productive industries in the fine sections it penetrates, and soon build up a fine paying business.

## THE UTAH EASTERN.

This road connects the coal beds of Chalk Creek (Weber River) with Park City. It was designed to connect them with Salt Lake City, via Parley's Canon, but somehow the money could not be had to complete it further.

This portion of the road built was mainly by the Ontario Silver Mining Company, because the wood in the neighborhood was exhausted, and they had to have the coal.

## THE ECHO & PARK CITY RAILROAD.

This is a branch of the Union Pacific. The Echo & Park City connects with the Union Pacific, so, all the business between Salt Lake City and Park City is done by the Union Pacific. It amounts, at present, from $80,000 to $100,000 a year.

## THE UTAH & NEVADA.

This road connects the mining district on the western slope of the Oquirrh Mountains with Salt Lake City. It strikes west across Jordan Valley, and via the southern shore of Great Salt Lake, rounds the end of the Oquirrh, and turns southward at Stockton, about forty miles. Its harvest time is in the bathing season, when its rolling stock is taxed to the utmost, the only good bathing ground on the lake lying on its route, at Garfield Beach and Lake Point, twenty to twenty-two and a half miles from the city. It was designed as a Nevada road, but the Union Pacific, which owns it, preferred to start one for that purpose of standard gauge and from Lehi.

## THE DENVER & RIO GRANDE WESTERN.

This is the Utah Division of the Denver & Rio Grande system. It consists of the main line of 310 miles from the Colorado line, through Price Canon, Utah Valley, and Salt Lake City, to Ogden, and branches therefrom to the mining camps of Bingham, Little Cottonwood, and Pleasant Valley, these branches aggregating some fifty-eight miles.

## TRADE AND COMMERCE.

In the years preceding the completion of the Pacific Railroads, the imports of Utah, according to the most careful estimate possible, were between 10,000 and 12,000 tons per annum. The exports were almost nothing. The overland emigration, the stage lines, and the troops, bought the farmer's grain and surplus stock, and these were almost the only cash resources of the Territory. The railroad, constructed both from the East and the West, joined tracks on Promontory Summit, May 10, 1869, and the same year the Utah Central was built from Ogden to Salt Lake City, connecting the capital of Utah with the trans-continental railroad line. The second year thereafter, the exports and imports of the Territory, as indicated by the books of the Utah Central Railroad Company, were 80,000 tons, a seven-fold increase.

Since that they have averaged about 250,000 tons yearly, two-thirds of which were imports, and about one-half of which (coal in part, coke, charcoal, bullion, lead ores, lead, iron ore, machinery in part), was incidental to mining. Of the rest, the largest items were merchandise, building material, lumber, railroad material, and produce. Sundries includes wagons, live stock, wool, hides, dried fruit, salt, hay, etc. The importation of iron ore and charcoal has practically ceased. The Territory will always have to import its hard and finishing woods, but in this respect it is no worse off than the entire prairie and mountain part of the country, including the Pacific Coast. It must also expect to always import, more or less, its lumber, sash, doors, blinds, wagons, agricultural implements, and furniture, for not only does it lack the hard and finishing woods of native growth, but the best quality of clear lumber cannot be cut out of native timber. The importation of produce includes corn, some other grains, and seeds, fruits and vegetables from California (out of season), oysters, salmon, fresh fish and shell fish. The item of live stock embraces livery horses, and blooded horned stock, blooded bucks and swine. The making of leather, or at least of its products, may be expected to increase, as also the manufacture of home-grown wool, and the importation of these kinds of merchandise to correspondingly diminish. Our machinery is largely made here, exclusive of new silver mills, engines of more than 100-horse power, agricultural and railroad machinery.

## GENERAL BUSINESS.

It is assumed that the amount of business by jobbers and retailers, annually, is about $15,000,000. There is doubtless quite $5,000,000 engaged in the business. No merchants stand higher in the East on the score of credit than those of Utah. Not that they are more upright than other merchants, but from the situation and circumstances, a larger percentage of cash than usual is employed in doing the same amount of business. Some of the heavier houses pay cash down altogether. Probably the mean time on all goods bought by Utah buyers would be but little more than double that required for them to make the trip out, say sixty days; and 20 per cent. of their value, delivered, is freight charges, always paid in cash on delivery. There have been but thirty-five failures, with aggregate liabilities of $650,000, in the last six years, and these were not felt abroad. A good many houses import in a small way, but the weight of the business with the outside is done by a very few houses, which have ample capital and do not require credit. One of the heaviest of these is Zion's Co-operative Mercantile Institution, of Salt Lake City, which, with its branch houses at Ogden and Logan, imports one-third of all the merchandise used in the Territory. It has 800 stockholders and a cash capital of $1,000,000. There is a co-operative institution in nearly every farming settlement, buying in general of the big institution at Salt Lake City, and selling through it the produce they take in trade, but they are *not branches. They* were organized about eighteen years ago, and everybody *able to earn or buy a share* of stock was taken in. Their anxiety to earn and disburse big dividends has created opposition in many places, and in others the large owners in the start have become almost the sole owners. Still they have thousands of stockholders and most of the people patronize them.

## ENLARGEMENT OF BUSINESS AND TRADE.

Heretofore the trade of Utah has been largely confined within itself, but that is rapidly changing. Its central location and fine climate have always made it more or less the headquarters of the mountain people. This tendency is on the increase. The citizens are beginning to wake up to the natural advantages of their position; in the center of the only habitable transverse belt of the mountains, moderate in altitude, with a delightful and salubrious climate; full of rich valleys easily watered, and of mineral mountains covered with timber, and affording limitless pasture and water power; giving rise to a mixed industry, farming, stock-growing, fruit-rising, mining, smelting and manufacturing, the products being coal, iron, gold, silver and lead; the cereals, fruits, and vegetables common to the latitude; butter, cheese, and various manufactured articles; presenting the natural route of trade and commerce containing already 160,000 people, and rapidly filling up. They are beginning to see the advantages in a commercial sense of holding the key to such a country, and the tendency to grasp and improve them is growing. The railroad system is being rapidly extended, drawing after it into the ever-widening field, capital, trade, manufactures, and business enterprise. Ogden, situated at the intersection of trans-continental and transverse railroads, has a large trade along the lines of these thoroughfares and in the sections they traverse. There is little agriculture or manufacturing save in this central trough-like depression in the mountains between Nebraska and California, and the adjoining sections, east and west, chiefly mineral, or grazing in resources, afford an ample market for Utah's products of all kinds and a good field for the display of business enterprise and ability. The citizens are more and more engaging in extensive business operations beyond the confines of Utah, such as mining, smelting, lumbering, and stock-raising, and this naturally enlarges the scope of commercial influence. Yearly, trade is finding new channels and broadening and extending on every hand the theatre of its operations. All that is needed to give Utah unquestioned commercial pre-eminence among the rising young commonwealths of the mountains is a comprehensive view of the situation and a resolute grasping and improvement of the opportunities it presents.

The increase in the volume of banking business of any region is probably the best index of solid and permanent growth. The money on deposit in the banks of Utah now and for a few years past is shown by the following:

| | |
|---|---|
| November, 1878 | $1,021,491 |
| November, 1879 | 1.803,232 |
| November, 1880 | 2,390,654 |
| November, 1881 | 3,375,974 |
| November, 1887 | 5,000,000 |

In this aggregate deposits in Logan, Park City, Corinne, and Richfield are estimated at $140,000. The remainder, which include all the National and the heaviest *private* banks, is taken from their books.

The Chicago *Tribune* prints the following table, showing how much faster, relatively, Chicago has increased her surplus, than the other cities named, in the past nine years:

| | Oct. 1, 1878. | Oct. 5, 1887. |
|---|---|---|
| Chicago | $ 25,553,900 | $ 84,317,000 |
| Boston | 80,918,000 | 101,826,900 |
| Philadelphia | 52,911,200 | 86,583,900 |
| New York | 216,332,000 | 345,826,000 |

It is of interest as showing the amount of bank deposits in these cities, their rate of increase, and as a means of comparison between commercial centers. Our surplus, that is, the deposits of Salt Lake City, exceed $4,000,000. Salt Lake City's population is reckoned at 30,000. Chicago, with her 800,000 population, must have about 105,000,000 of deposits, or 35 per cent. more than she has before she has as much in proportion to population as Salt Lake City has. Philadelphia is still further behind Salt Lake City, relatively. Boston, on the contrary, beats Salt Lake City more than twice over, but then, she has seven times as many years on her head. New York beats Salt Lake City by about 75 per cent., relatively to her population. Thus, she has fifty times our population and eighty-six times our bank deposits.

These places have some advantages over Salt Lake City in years, location, population, diversified industries, accumulated wealth, but the inter-mountain metropolis is doing very well. Her surplus appears to have increased by 400 per cent. in nine years.

## SETTLEMENT OF LANDS.

As showing the settlement and disposition of the public lands in this Territory, the following statement of the total business of the land office from the time of its opening in March, 1869, to the end of the present fiscal year is given:

| Kind of Entries. | Number of entries made. | Acreage. | Amount. |
|---|---|---|---|
| Pre-emption declaratory statement | 10,632 | 1,275,640.00 | $31,896.00 |
| Homestead | 7,813 | 9,953,630.00 | 123,595.01 |
| Final homestead | 3,718 | 507,274.51 | 20,556.95 |
| Cash entries | 3,141 | 312,738.75 | 470,770.00 |
| Desert entries | 2,209 | 413,889.77 | 103,486.35 |
| Final desert entries | 426 | 69,812.58 | 69,812.53 |
| Timber culture entries | 794 | 97,632.25 | 9,612.00 |
| Final timber culture entries | 2 | 240,00 | 8.00 |
| Coal pre-emption filings | 749 | 89,880.00 | 2,247.00 |
| Coal cash entries | 75 | 10,678.33 | 139,482.02 |
| Mineral applications | 1,598 | 1,448.00 | 14,430.00 |
| Mineral entries | 1,374 | 11,020.79 | 56,680.00 |
| Land warrants | | 23,957.00 | 615.00 |
| Soldiers' and sailors' scrip | | 13.00 | 27.00 |
| Agricultural college scrip | | 84,912.04 | 2,232.00 |
| Valentine scrip | | 440.00 | 11.00 |
| Chippewa scrip | | 80.00 | 2.00 |
| Supreme court scrip | | 4,360.02 | |
| Adverse claims | 749 | 612.05 | 6,125.00 |
| Testimony fees | | | 4,056.64 |
| Central Pacific Railroad sections | | 300,588.89 | 3,767.40 |
| Union Pacific Railroad sections | | | 506.00 |
| Timber sold | | | 127.08 |
| Stumpage | | | 2,788.72 |
| Timber depredations | | | 12,632.59 |
| *Total* | | 4,158,743.38 | $1,075,457.19 |

The total number of acres of public land surveyed in the Territory to June 30, 1887, amounts to 11,711,118.01.

## TAXATION.

There are no debts on account of railroad construction. The revenue laws are liberal. Rates of taxation are three mills for Territorial and three for school purposes; counties may levy, in their discretion, not more than six; towns are restricted to five for ordinary expenses, five for opening, improving and keeping in repair the streets; while they are all empowered to tax in their discretion to provide water and waterworks. Real estate is directly taxed upon assessment of value. Mines and bullion are exempt, but improvements on mines are not. Personal property, although owned by non-residents, is taxed if within the Territory. From taxable credits, debts are allowed to be deducted. Stocks of incorporations whose property is taxable, are exempt. Taxable property, $35,865,865. In no other state or Territory are the taxes so moderate.

## EDUCATIONAL.

An annual Territorial tax of three mills is levied for ordinary school purposes, and the school districts may levy such a tax, not exceeding 20 mills per annum, as may be thought necessary for school purposes, if approved by two-thirds of the tax-payers of the district at a meeting called for the purpose. There are about 400 district schools; nominal value of school property, $500,000; children between 6 and 18, 37,000; attendance 40 per cent.; two terms of twelve weeks each year, one of them paid for by tuition fees, which average $4 a term. Besides the district schools there are the Deseret University, Brigham Young Academy, and about thirty private schools. Also, sustained by the Congregationalists, Presbyterians, Episcopalians, Methodists, and Catholics, sixty mission schools with an enrollment of 5,000, employing 150 teachers, at a cost of $75,000 a year, owning school property worth $200,000. Tuition in these schools costs an average of $8 a term, and there are four terms in the year. Some of them are free, and all are graded. Nine of them have high school departments, and most of the teachers rank with high school teachers. The Brigham Young Academy and Deseret University are high schools, averaging an attendance of 200 each, and advertising three courses of study—preliminary, scientific and classical-preparatory. The latter has a library of 2,600 volumes, standard and miscellaneous, a laboratory well supplied with mathematical, philosophical, and chemical apparatus, and a valuable cabinet of minerals and curiosities. It is partly sustained by tuition fees, but the Territory annually appropriates $5,000 toward its support on condition that it give a year's course of normal teaching to forty representative students from different parts of the Territory. This number nearly covers the average attendance in the normal department.

It may be said, upon the whole, that Utah affords the ordinary educational and religious facilities of the Territories. It has had no assistance, either in land or money, the policy of the Federal Government being to restrict these favors to the States, which need them far less than the Territories. In all the district and higher schools, some scholars are educated free, but not a great many. In the nature of things it cannot be expected. Some of the mission schools have a certain number of scholarships endowed by philanthropic persons, East, notably the Episcopal. The public provision, Territorial, is about $65,000 a year. The districts may be expected to raise half as much more by taxation, enough, say, to give the total school population one term of three months schooling every year. Tuition may be supposed, though it is a rather violent supposition, to provide for another term per year, and that is the utmost that can be expected at present.

No effort should be spared, and in case of the mission high schools, and the Salt Lake Academy, none will be spared, to make them equal in every respect to high schools in the East. Instead of Utah people sending their boys and girls to the States to finish their education, they will soon supply their own wants in this respect by encouraging their home academies, and also the wants of adjoining Territories. They should also turn out a superior grade of teachers, and by that means keep alive and ever increase the interest in education in this and the surrounding young commonwealths, stimulating the people to greater efforts, to the furnishing of better facilities, better qualified and better paid teachers, and steadily raising the standard of buildings, of text books and apparatus, of the system of teaching and studying. The attention of wealthy people who desire to devote part of their means to the advancement of education is earnestly called to this field. In all the Territory a year's schooling costs, either in taxation or tuition, or both, from $16 to $30 a scholar, probably an average of $20, against $4 in Switzerland and $5 in Germany. No aid in lands has been rendered by the General Government, and none is likely to be until Utah becomes a State. No practicable remedy for this suggests itself. But at the same time, the quality of teaching might be very greatly improved. There are at least five schools in Salt Lake City, to-wit: the Rocky Mountain Seminary, the Salt Lake Academy, the Salt Lake Collegiate Institute, St. Mark's and St. Mary's, that might be enabled by a generous endowment in the ordinary way, to afford teaching at $16 instead of $28 or $30 a year, and to become and maintain themselves as high schools equal to the very best in the country, each sustaining a normal department, and turning out every year a score of finished teachers, almost infinitely better qualified for their duties than the average now teaching in the Territory.

There are published in Utah six daily, twelve weekly, two semi-weekly, two semi-monthly and two monthly papers, with an aggregate circulation of nearly 50,000 copies. There are four libraries, two Territorial, one law, one Masonic, the latter managed as a circulating library, and having 6,000 volumes, and all steadily growing. There are of benevolent societies probably 200, one or more in nearly every town, nine-tenths of them semi-religious. The Masons and Odd Fellows and Knights of Pythias have some twenty-five lodges in the leading towns, with assets valued at $50,000.

The Hebrews have one congregation, one relief, and one benevolent society, with assets of $6,000. Temples of Honor and reform clubs and temperance societies have lodges in the principal towns.

## ATTRACTIONS—SALT LAKE CITY.

Of pleasure resorts in Utah, Salt Lake City ranks first, located on the bar of a fine mountain stream which tips it up gently toward the setting winter sun. The streets are spacious and wide apart, bordered with trees and purling brooks, giving ample room for buildings, gardens, orchards, shrubbery, and ornamental grounds. Foliage largely conceals the houses in summer,and as the country is naturally destitute of trees, the contrast is striking and pleasing. The mean summer temperature is about 74° but on account of the dry and rare atmosphere it is not more oppressive than a temperature five degrees lower would be at sea level. Although the mercury often reads above 90 in July and August, sunstroke is unknown, severe thunder and lightning are infrequent, the nights are uniformly cool, and denizens of the city obliged to visit the East in the hot months, are exceedingly glad to get back again. There is no comparison between the comfort of the average Salt Lake City and the Eastern climate in the same latitude, and it is equally noticeable at all seasons of the year. The mean temperature in winter is about 32° and the Salt Laker often has occasion to felicitate himself on the enjoyment of the pleasantest of winter weather, when the great Eastern railroads are blocked up by snow, or the mercury at the chief centres of population day after day reads from fifteen to thirty below zero. The real winter holds from three to six weeks only. The annual mean is 51°, and a residence in the city is worth the while solely for the agreeableness of the climate.

The city has ample and pleasant hotel accommodations, and a good market, incurring comfort at reasonable prices; it has electric lights, gas, excellent water, supplied from City Creek, by means of piping laid under the streets, with frequent hydrants, and head sufficient to force it over the tops of the highest buildings: it has churches of the principal Christian denominations, and fair schools: twelve miles of street car lines, and two fine theaters. It is peaceful and orderly: taxes are very moderate; and from it the most popular places of resort—the Warm Springs, Great Salt Lake, the Cottonwoods, Bingham and American Fork Canons, and Parley's Park, are easily accessible: that is, one can visit most of these places and return the same day, if he chooses. The Warm Springs are less than two miles by the street cars from the principal hotels. The Hot Springs are less than four miles by rail or private conveyance. Great Salt Lake is reached on the south shore via the Utah & Nevada in twenty miles; on the east shore via the Utah Central in fifteen. One goes to Alta, in Little Cottonwood, by rail in twenty-five miles; thence horseback into Big Cottonwood, Parley's Park, or American Fork. The first two are reached by wagon in a few hour's ride, if preferred; the last by rail to the village of American Fork, and then horses or carriages. Bingham Canon is the same distance from the city by rail as Alta.

One of the most interesting points in the vicinity is Fort Douglas, a well-built, full-regiment post, located on a plateau about three miles east of and 500 feet above the city. The post and grounds are laid out with taste, a small stream of mountain water making the culture of trees, shrubbery, grass and flowers possible. The elevation gives almost a bird's-eye view of the city and valley. In the distance lies the Dead Sea of America, a blue band drawn along the base of island mountains, the vistas between which are closed by more distant ranges. In the north the Promontory divides the waters, ending far out in the lake. Across Jordan Valley the Oquirrh rises to a lofty height, white with snow a greater part of the year, and often veiled by clouds. On the south low hills, appearing to be thrown out in echelon, completes the enclosure of Jordan Valley, which lies an unrolled map at one's feet. An even finer view, and one much sought, is afforded from Ensign Peak, north of the city, one might say at the head of Main street, although its ascent must be afoot. Amongst the attractive objects in the city are the Tabernacle, a unique structure, with its immense organ, and seating capacity of 8,000: the rising white walls of the Temple, 100x200 feet on the ground; the Salt Lake Museum, a valuable collection of Utah minerals, and of curiosities from many lands; and the Warm Springs, nicely improved, and with commodious buildings and conveniences for all sorts of bathing. There are some good public buildings, and many noble private residences and beautiful grounds. A drive round the city and to Fort Douglas is interesting and enjoyable. It might well extend to Emigration Canon, near the Fort, or to Parley's Canon, further south. The country on the Cottonwoods, adjoining the city southward, is highly improved for several miles out. The system of city streets, making blocks of ten acres, is extended over this rural suburb, where they become country lanes, and afford delightful drives through cultivated fields, orchards, and improvised groves of trees. Occasionally there is a small sheet of artificial or natural water, improved and beautified with especial reference to the wants of pleasure-seekers. Street cars run to Liberty Park, a locust grove of 110 acres, belonging to the city.

It may be doubted, however, whether Salt Lake City affords any pleasure equal to that of pursuing the perpetually varying picture presented by the magnificent range of mountains, which rises abruptly to a height of 8,000 feet above the valley, with no accompaniment of foothills to conceal or dwarf its proportions. Much of the year it is white with snow. In the autumn it wears all the colors of the rainbow in succession, as its shrubbery is touched more and more severely by the frosts. In the spring only do its lower slopes present a green appearance. On northern exposures it is dark with pines. Its general summer hue is gray, although its light and shade and color are as variable as the wind that plays about its craggy summits, invades their recesses, and in its persistent efforts to crumble them, has chiseled out gorges in the solid rock thousands of feet deep, giving infinite variety of form and outline. These are but surface aspects, however. The interest in them is ever renewed, because they perpetually change with the seasons, or with the point of view. The range gets a deeper hold of one *from* its suggestions of primary forces and principles, such as had to do with the forming of the globe itself, and are now busying themselves with its destiny. It seems to materialize the idea of endurance, to be the emblem of strength, from everlasting to everlasting the same. Yet it has been gas in the fervent heat of the sun. It has been an ocean of liquid fire. It has been held in solution by primeval seas. They laid its foundations relatively six miles deeper than they now stand. The crust of the earth was broken through when it was uplifted and this enormous vault made. The impalpable ether which bathes its lofty heights has reduced them by many miles, and will, in a few year, spread its entire mass upon the floor of the ocean, where it has rested before. We must look to the sun for immutability, and may not find it even there. "But thou art, perhaps, like me, for a season: thy years will have an end. Thou shalt sleep in thy clouds, careless of the voice of the morning."

The basic rocks of the Washatch are quartzone, mica, and hornblendic schists. Next above these is a heavy bed of stratified quartzites. Next above, a bed of gray limestone, probably of silurian age, and a group of shales, clays, and quartzites intervenes between this and another limestone formation, which belongs to the carboniferous age. The range extends throughout Utah, and far into Montana, but it is seen to greatest advantage from Salt Lake City, and from the Valley for 200 miles north and south. Its canons are the result of erosion, and are due to the quantity of snow precipitated upon its higher regions. Many of its summits exceed 12,000 feet in altitude. The Twin Peaks, overshadowing Jordan Valley, rise 12,000 feet above the sea, and the high peak further south to 12,500. Everywhere it is an imposing and picturesque object, but overlooking the Salt Lake Basin from Mt. Nebo to Bear River Gates, it is a Titanic monument of nature's rearing, upon which, with incomparable touch, a new picture is painted by the same great artist every day.

## GREAT SALT LAKE.

The first mention of Great Salt Lake was by the Baron La Hontan, in 1689, who gathered from the Western Indians some vague notions of its existence. He romanced at length about the Tahuglauk, numerous as the leaves of trees, dwelling on its fertile shores, and navigating it in a large craft. Captain Bonneville sent a party from Green River, in 1833, to make its circuit, but they seem to have given it up on striking the desert on the northwest, lost their way, and after some aimless wandering, found themselves in Lower California. Until Colonel Fremont visited it, in 1842, on his way to Oregon, it is probable that its dead waters had never been invaded, or the solemn stillness of its islands broken. He pulled out from near the mouth of Weber River, in a rubber boat, eighteen feet long, for the nearest island, which, when he had climbed it and found it a mere rock, as he says, fourteen miles in circuit, he named "Disappointment Island." Captain Stansbury re-christened it "Fremont Island," and by common consent such it is called. Captain Stansbury found neither timber nor water on it, but luxuriant grass, wild onions, parsnips, and sego. Near the summit the sagebrush were eight feet high, and six or eight inches in diameter.

In the early spring of 1850, Captain Stansbury spent three months in making a detailed survey of the shores of the lake and its islands. He found the western shore a salt encrusted desert, in traversing which his men more than once well nigh perished for want of water; the northern shore composed of wide salt marches, overflown under steady southern winds; the Promontory Range, projecting thirty miles into the lake from the north, having many sweet water springs around its base, and a good range, (now covered with flocks and herds); the southern shore set with mountain ranges, standing endwise to the lake, with grassy valleys intervening -- Spring, Toelle, and Jordan; the eastern shore fair irrigable land. The latter was then already dotted with infant settlements, and was producing fifty bushels of wheat to the acre. Almost everywhere land and water were divided by mud flats, across which they were forever dragging their boats and packing their baggage.

The principal islands are Antelope and Stansbury, rocky ridges, ranging north and south, rising abruptly from the lake to an altitude of 3,000 feet. Antelope is the nearest to Salt Lake City, and is sixteen miles long. Stansbury is twenty miles to the westward of Antelope, and twelve miles long. Both at that time were accessible from the southern shore by wagon. Both have springs of sweet water, and good grass for stock. The view from the summit of Antelope is described as "grand and magnificent, embracing the whole lake, the islands, and the encircling mountains covered with snow—a supurb picture, set in a framework of silver." Mention is made of the scenery on the eastern side of Stansbury. "Peak towers above peak, and cliff beyond cliff, in lofty magnificence, while, crowning the summit, the 'dome' frowns in gloomy solitude upon the varied scene of bright waters, scattered verdure, and boundless plain (western shore) of arid desolation below." Descending one day from the "dome" the gorge, at first almost shut up between perpendicular cliffs of white sandstone, opened out into a superb, wide, and gently sloping valley, sheltered on each side to the very water's edge by beetling cliffs, effectually protected from all winds, except on the east, and covered with a most luxuriant growth of bunch-grass. Near the shore were abundant springs of pure, soft water," probably covered by the lake now. There was no sweet water on the western side of he island. Of minor islands, there are Fremont, Carrington, Gunnison, Dolphin, Mud, Egg, Hat, and several islets without names. With the ranges enclosing the valley they present water marks at different heights, one tprincipal one, 800 feet above the present lake level, indicating a comparative recent receding of the waters, either from change of climate or the relative level of the mountains and basin.

In all probability the whole area between the Sierra Nevada and the Wahsatch was once a lake, in which the mountains rose as islands, and of which the lakes now existing, large and small, are the remains. The deposits which cover the lowlands are chiefly calcareous and arenaceous, and often filled with fresh water and land shells, indicating a very modern origin. The formation of the islands and shore ranges adjoining Salt Lake is metamorphic; the strata distinctly marked and highly inclined, but attaining no great elevation; generally overlaid with sandstones and limestones of the carboniferous age, both partly altered, the former constituting the loftier eminences; in places highly fossiliferous, in others, losing their granular character and becoming sub-crystalline, or threaded by veins of calcareous spar; the sandstones often from metamorphic action taking the character of quartz. In places on the islands, the surface is changed rocks, talcose and mica slates, hornblende and sienite. Captain Stansbury found the top of an island twenty miles west of the northern point of Antelope to consist of fine roofing slate. A nail could be driven through it almost as easily as through a shingle. It was in unlimited quantity. On another small island he found cubic crystals of iron pyrites in seams of ferruginous quartz. Near the point of Promontory Range he noticed a cliff of alum shale nearly a mile in length, traversed by dykes of trap, the shale containing numerous veins of very pure fibrous alum. Close by were strata of alum, slate, fine grindstone-grit, sandstone and albite. It is a manganese instead of an alkaline or true alum, but may be substituted for common alum in tanning leather, and also, as a coloring agent in dyeing. Some of the islands are crowned with ledges of black and cream-colored marble.

Nothing lives in the water although aquatic birds cover the shores and islands in the breeding season, either carrying their food from the fresh water streams that feed the lake or feeding on the lava of diptera, which accumulate in great quantity on or near the beaches. Captain Stansbury navigated and examined the lake thoroughly, and was often oppressed by its solitude. His boat was named the "Salicornia," contracted to "Sally" for common use, but he left no data as to its style and tonnage, except that it was flat-bottomed. Next in order among the navigators of the lake were the Walker Brothers, merchants of Salt Lake City, who sailed a lonesome pleasure yacht for some years. There is now a considerable yachting fleet. In 1868 General Connor built and launched the "Kate Connor," a small steamer, for the purpose of transporting railroad ties and telegraph poles from the southern to the northern shore. The next spring he built a schooner of 100 tons burthen, called the "Pluribustah." These were followed by a pleasure steamer, shipped by John W. Young from New York, and in 1870 by the building and launching of a first-class boat, costing $45,000, by Fox Diefendorf, called at first the "City of Corinne," afterward changed to "General Garfield." This boat is used chiefly for excursions, there being no business to justify Salt Lake navigation. The industries of its shores are not so extensive, it seems, as those of the Tahuglauk in La Hontan's time, or perhaps railroads serve them better. The "Kate Connor" and her kindred long ago found a resting place at the bottom of the lake.

Though the land in sight is, for the most part, brown and sunburnt, an excursion on the lake is exceedingly interesting. The reader is supposed to have gone out to the south shore via the Utah & Nevada, the distance being twenty-two miles, and to have embarked at Garfield Beach. Our course is northward, between Antelope and Stansbury. The water is of a beautiful aquamarine hue, and so clear that the bottom can be seen to the depth of four fathoms. Behind, on the shore, are the Oquirrh and Spring Valley ranges, with Tooelle (Tuilla) Valley intervening and rising as it recedes so as to hide Rush Valley, into which the Dry and Ophir canons open.

few miles from shore the village of Tooelle is indicated by an oasis of foliage, while far to the west under the gleaming Spring Valley Range, high enough to retain a few snow banks the year around, lies the village of Grantsville. Abreast of Antelope Island we distinguish grazing herds. If boring on this island would bring plenty of sweet water, what a fruit plantation it might be made, with the lake to keep off the frosts.

Between two and three hours out, having passed Stansbury, the view northwestward enlarges, and we might imagine ourselves standing out to sea but for an islet or two breaking the horizon. Through notches in the Cedar Mountains on the west the eye catches the snowy foreheads of the Goshoot and Deep Creek ranges; while on the east the Wahsatch rises 8,000 feet, a rugged, massive, gray wall of weather-sculptured rock 200 miles in length. Soon we have run past Antelope and are abreast of Fremont, which may be known by a rock upon its crest, resembling a castle. Continuing northward, we shall soon have the Promontory Range on our left, with the water shoaling from fifteen to six or seven feet in our run of twenty miles, where we enter the channel of the Bear River. Forty years ago Fremont could not enter Great Salt Lake from Bear River in a rubber boat eighteen feet long, for want of water. Now a boat of 250 tons burthen passes from the lake into the river over the bank twenty miles from the lake shore. We can proceed up the river to Corinne, where the Southern Pacific Railroad crosses it, but the lake excursions do not extend so far, or even so far as we have come. They usually go out fifteen or twenty miles—far enough to get a good view of the surroundings—and there are few more interesting sights to be seen anywhere, and then return. The steamer "General Garfield" has been dismantled, and is used as a house on the bathing ground of Garfield Beach, but others, better adapted to the purpose, and very much less costly, appear in its stead.

Great Salt Lake covers an area of 2,500 square miles, and its surface is higher than the average Alleghany Mountains. Its mean depth, probably, does not exceed twenty feet, while the deepest place between Antelope and Stansbury, is sixty feet. The two principal islands used to be accessible from the shore by wagon; but the lake gradually filled five or six feet, from 1847 to 1856, and then slowly receded to its old level. In 1863 it began to fill again, and in four or five years had attained a stage considerably higher than its present level, perhaps four or five feet. In 1875 a pillar was set up at Black Rock, by which to measure the rise and fall, resembling a tide, but having no ascertained time. It is very slight compared with what it formerly was. Prof. Gilbert, of the Geological Survey, says that twice within recent geological time,it has risen nearly a thousand feet higher than its present stage, and, of course, covered vastly more ground. He calls that lake after Captain Bonneville, the original explorer of these regions, and whom Irving has immortalized, Lake Bonneville. Causes which learned men assign as producing what they call a glacial period might easily fill the lake until it extended nearly the whole length of Utah. During the last high stage, Prof. Gilbert says there were active volcanoes in it. It is generally agreed that its first outbreak was via Marsh Creek, and the Portneuf into the Snake. At the present height of that channel (where the Utah & Northern passes out of Cache Valley) it remained a long time stationary and then seems to have receded rapidly to a second stationary point, and so on down to its present stage. There is one very heavy beach mark on all the hills surrounding its extended area, and on the hills which were then islands, and a curious thing is the fact that this beach-mark varies in altitude from 100 to 300 feet, showing that the earth in this valley is still far from having reached a stable equilibrium.

It was once popularly supposed that the lake communicated with the ocean by a subterranean river, which made a terrible whirlpool somewhere on its surface. Needless to say neither has been found. Receiving so many streams and having no outlet, it has become very saline from concentration and the inflow of salt springs. The saline or solid matter held in solution by the water varies as the lake rises or subsides. In 1842 Fremont obtained "fourteen pints of very white salt" from five gallons of the water evaporated over a camp fire. The salt was also very pure, assaying 97.80 fine. In 1850 Dr. L. D. Gale analyzed a sample of it which yielded full 20 per cent. of pure common salt, and about 2 per cent. of foreign salts, chlorides of lime and magnesia. Sergeant Smart, U. S. A., analyzed a sample in 1877 and found an imperial gallon to contain nearly 24½ ounces of saline matter, amounting to 14 per cent., as follows:

| | |
|---|---|
| Common salt | 11.735 |
| Lime carbonate | .016 |
| Lime sulphate | .073 |
| Epsom salt | 1.123 |
| Chloride of Magnesia | .843 |
| Percentage of solids | 13.790 |
| Water | 86.210 |
| | 100. |

One hundred grains of the dry solid matter contained:

| | |
|---|---|
| Common salt | 85.089 |
| Lime carbonate | .117 |
| Lime sulphate | .531 |
| Epsom salt | 8.145 |
| Chloride of Magnesia | 6.118 |
| | 100. |

It compares with other saline waters about as follows:

| | Water. | Solids. |
|---|---|---|
| Atlantic Ocean | 96.5 | 3.5 |
| Mediterranean | 96.2 | 3.8 |
| Dead Sea | 76. | 24. |
| Great Salt Lake | 86. | 14. |

And in specific gravity, distilled water being unity:

| | |
|---|---|
| Ocean water | 1.026 |
| Dead Sea | 1.116 |
| Great Salt Lake | 1.107 |

The solid matter in the water varies between spring and fall, between dry and wet seasons, and also between different parts of the lake, for nearly all the fresh water is received from the Wasatch on the east. It is the opinion of salt makers that an average of the lake at its present stage would show *the presence of* 17 per cent. of solid matter. It is undoubtedly a concentration of the waters of the ocean, in which, as in Salt Lake, says Dr. Smart, the common and magnesian salts are held in solution, while the insoluble lime salts are precipitated to the bottom. Captain Stansbury found by experiment that it answered perfectly for preserving meats.

Within the last few years the lake has become of great interest as a watering place. In the long sunny days of July, August and September, the water becomes deliciously warm, and is much warmer than ocean water a month earlier and a month later. It is so dense that one is sustained indefinitely without effort, and vigorous constitutions experience no inconvenience from remaining in it a long time. A more delightful and healthy exercise than buffeting its waves when it is a little rough can hardly be imagined. But for its tendency to float the limbs to the surface and the necessity of keeping it out of the nostrils, it would afford the best swimming school in the world. As it is, all ages and sexes in Salt Lake are fast mastering the art. Experience has proven its hygienic benefits. Whether it be the stimulating effect of the brine on the skin, of the saline air on the lungs, or the exercise of the muscles involved in swimming, or all of them together, many have come to the conclusion that a few weeks' sojourn on the lake shore in the hot season is absolutely essential to their weathering the year. The lake coast at the north end of the Oquirrh for two or three miles is sandy, soft to the feet, clean and shelving. During the hot months cheap rains leave for the bathing ground daily at the close of business. The run from Salt Lake City to Garfield Beach is made on the Utah & Nevada Railway in thirty-five minutes, and the excursion, aside from the bathing, is most delightful. There is a hotel at Lake Point, a large private house at Black Rock, and bathing houses all along the shore. In fact the great bathing resort of the inter-mountain country is

## GARFIELD BEACH.

This is the only bathing resort on the entire lake shore having a clean, sandy beach, free from mud, rocks and vegetable matter. The veriest novice, the most inexperienced lady or child, can bathe here with perfect safety. The accommodations are on a mammoth scale and modern in design. There is a station building 350 feet long with all the conveniences for refreshments. Here thousands daily partake of the choicest edibles and viands obtainable. A capacious pavillion, 165x65 feet has been built over the water 400 feet from shore and approached by a covered pier, and some 400 nice dressing rooms containing all the comforts necessary for the most fastidious bather. Fine musical talent is employed throughout the season, enlivening the scene in the grand pavillion every afternoon with a concert such as is rarely enjoyed except at the larger eastern resorts. Trains carrying from 300 to 600 passengers each run from Salt Lake City to Garfield Beach almost every hour after the middle of the forenoon, and it is nothing unusual to see 1,000 delighted visitors disporting themselves at once in the briny waters at Garfield *Beach.*

*Some day Garfield* Beach will be built up with private watering-place *cottages, plentifully* interspersed by large, airy hotels, with water and trees for the grounds, and it will be thronged in the bathing season as no ordinary seaside resort is. It offers unparalleled attractions in its way—rest, comfort, saline air, and the most delightful and invigorating exercise, calling into play all the muscles, never tiring, the water is so bouyant; never chilling, it is so warm; free from danger, recreating and invigorating, a tonic for all, a remedy for many ills, health-restoring, strength-renewing. It is becoming understood that for the renewal of life and energy there is nothing like a few weeks of Great Salt Lake bathing, interspersed with visits to the medicinal springs, and the mountain canons and lakes.

The Giant's Cave, only a short distance from the beach is an additional attraction of this popular resort. It is an opening extending over 300 feet into the mountain side, with a ceiling from ten to seventy-five feet high.

## MINERAL SPRINGS.

Of the chemical and thermal, salt, sulphur, soda, and chalybeate springs which abound in all parts of Utah, the Warm Springs of Salt Lake City are best known and most resorted to for comfort and health. Dr. Gale says the water is a Harrowgate water, abounding in sulphur. It is very limpid, having a strong smell of sulphurated hydrogen, and contains the gas, both absorbed in the water and combined with mineral bases. Following is an analysis by Dr. Charles T. Jackson, of Boston:

"Three fluid ounces of the water, on evaporation to entire dryness in a platina capsule, gave 8.25 grains of solid, dry, saline matter, as follows:

| | |
|---|---|
| Carbonate of lime and magnesia | 0.240 |
| Peroxide of iron | 0.040 |
| Lime | 0.545 |
| Chlorine | 3.454 |
| Soda | 2.877 |
| Magnesia | 0.370 |
| Sulphuric acid | 0.703 |

It is slightly charged with hydro-sulphuric acid gas, and with carbonic acid gas, and is a pleasant, saline mineral water, having the valuable properties belonging to saline sulphur springs."

Issuing from the mountain side in large volume, temperature 95° to 104°, the water is conveyed in pipes into two or three bathing houses, containing plunge, shower and tub baths, and dressing and waiting rooms. The property is owned and improved by the city. It is connected with the leading hotels by the street cars, and is visited by everybody, the water being considered very efficacious in the cure of many diseases, paralytic, rheumatic, and scrofulous.

Some other springs in Utah have been improved, and more ought to be. Three miles north of Salt Lake City, Beck's Hot Springs boil up from under the rocks in such quantity as to make a lake covering two square miles. *The temperature is* 128°, and the sulphurous fumes are almost stifling. The waters are almost identically the same as those of the Warm Springs above described, but by some are more highly esteemed, on account of their extreme heat. The improvements are more extensive than at the Warm Springs. Thousands avail themselves of these convenient baths, and many testify as to their curative powers.

## THE UTAH HOT SPRINGS.

What were long known as the Red Springs, ten miles north of Ogden, are hot waters so impregnated with iron as to kill the vegetation over a large area, and color the ground a crimson red. A large building for the use of these springs in any way experience may suggest, chiefly at present for bathing, was erected in 1878. This has since been supplemented by other improvements until the Utah Hot Springs, as they are now called, are the best equipped of any in the west. The waters pour forth in great volumes from crevices in the rocks, at a temperature of 125°, and containing such ingredients as chloride of sodium, iron, magnesia, and nitre, in strong solution. For years the waters of these springs have been known to possess peculiar medicinal properties. In early days the people for miles around would come and carry away the water in barrels and casks, and it would be used as a blood purifier.

For rheumatic trouble nothing can surpass the waters of the Utah Hot Springs, although there is occasionally a case where a patient is not benefited, but on the contrary, the disease is aggravated by the use of the water for drinking or bathing purposes. Such cases are rare, and cannot be accounted for. As a blood purifier, the water from these springs has no equal. The water is quite salty, and very warm where it flows out of the ground. Even after flowing through an open trough for several hundred feet into the enclosed pools, it is so hot that few people can bathe in it with comfort at first. A large pool has been constructed outside of the building, where it is very pleasant to bathe during the summer. Although the water is salty, it possesses other mineral properties, which do not make it unpleasant to drink. The Utah & Northern Railway has a station at the Springs, and trains pass so frequently as to make the spot very easy of access. Besides regular bathing trains are run at convenient hours from Ogden.

Further north, twelve miles from Bear River Gates, is a group of springs issuing from between strata of conglomerate and limestone, within a few feet of each other, of which one is a hot sulphur, a second warm salt, and the third cool drinkable water. The volume from these springs is copious, but they run some distance before they become thoroughly mixed, although in the same channel.

## THE WASATCH CANON.

The Wasatch Mountains, like other great chains, are in many places a series of parallel ranges enclosing the heads of lateral streams, the canons only occasionally breaking through into the Great Basin, or the Colorado River or Snake River basins. The divide between the waters flowing into the Colorado and the Great Basin is crossed by the Union Pacific Railroad at

Reed's Summit, 7,463 feet above the sea. Descending a few miles it crosses Bear River at an altitude of 6,969 feet, here flowing generally northward, following it down ten miles, leaving it 6,656 feet above the sea, thence surmounting Echo Pass, 6,785 feet in height, it begins the direct descent into the Great Basin through Echo and Weber Canons, crossing Weber River at an elevation of 5,240 feet, and striking the level of Salt Lake at Ogden, 4,290 feet. Echo Canon is no canon in the true sense. A wall of sandstone rises perpendicularly on the north 300 or 400 feet; on the south there is no wall and little rock, but a succession of grassy ridges, sloping smoothly toward the stream. It strikes Weber River, another northward flowing stream, about midway of its course, and the railroad follows it down through a valley for five or six miles below Echo City, to the "Thousand Mile Tree," where the mountains draw together, and the first canon commences. The valley suddenly narrows to a gorge, the rended rocks tower to the sky, and almost overhang the train. Through tunnels and over bridges this is cleared in half a dozen miles, the mountains recede again, and soften down into mere hills in comparison. An oval valley like the one above is passed, the mountains again close in on the river, and the train enters Devil's Gate Canon, where the naked rocks rise half a mile in the air. Ages ago they presented a fixed rock dam, which it seems the river could never have conquered, but it has, and through the passage made by its persistence, the road soon emerges from Devil's Gate into the summery airs of the valley. The scenery has been described and illustrated until the traveling public is familiar with it. But one gets only a slight idea of its beauty and grandeur from a ride through it on the railroad. He must stop off, and on foot or horseback, explore the side streams and reach various elevations half a mile above the river before he can be said to have seen it at all.

Bear River flows a long distance northwards before it finds a passage outward into Cache Valley, and thence into Salt Lake Valley. Similar the Provo, rising near the source of the Weber, and flowing southward, has its Alpine valleys, and finally canons out into the basin. So with the Sevier, and its affluents, and so to a less extent the various minor streams that flow westward into the basin directly from their sources, as Logan and Blacksmith Forks, Box Elder Creek, Ogden River, the Cottonwoods, Americaan and Spanish Forks, and a great many others. One can see something of their beauties in hastily passing through them, but to get the full benefit of them he must have a camp outfit, his own conveyance and time, saddle horses, hunting and fishing tackle, and all the paraphernalia of the sightseer, the tourist, and the sportsman. For such it is hard to select the locality, since the Wasatch Range affords such an endless variety from end to end.

Cache Valley, which is traversed from end to end by the Utah & Northern Railway, is an inviting field for the tourist. It is literally cached among the ridges of the Wasatch, like Sanpete, Ogden, Alpine, Morgan, Echo, Rhodes, and Sevier valleys; and is as though, round a symmetrical oval area, ten by fifty miles, the mountains had risen or ranged themselves at some mysterious bidding, to show what could be done in the way of valley making. It is about 4,500 feet above the sea, copiously watered, enclosed by mountains 8,000 feet high, in whose gorges the snow lies till August, their sloping sides meanwhile invaded by the lively green of the valley, which creeps in bands to their summits between the snow banks, or appears in sunny places among the scattered pines and dark points and ridges of rock. A fair sprinkling of forest would perfect the picture, but this it lacks, and the green of the valley, and mountains only relieves the eternal gray-brown of everything else, after all. The range on the east is the main Wasatch, deeply notched by the streams, which are alive with trout, and affords passage over fine roads to Bear Lake Valley, fifty miles eastward. Where the rivers emerge from their canons and rush laughing into the sunshine their waters are caught up and led in a thousand trickling rills to bless the fields with fatness. Some lighter streams and springs perform the same kindly office for the west side, and so there is a belt of cultivated land dotted with towns all around the edge of the valley. Of these Logan is the largest, and Smithfield the prettiest. From the summit of the divide, crossed by the Utah & Northern, Cache Valley is a pretty sight. One can drive on fine roads all around it. It is central to Soda Springs, and Bear Lake, and there are good roads over hill and dale southward into Salt Lake Valley via Box Elder Creek or Ogden River.

The same section may be penetrated almost as well from Ogden. Of the interesting places in the immediate vicinity of Ogden, the canon of Ogden River ranks highest. There is a good carriage road through the canon, which is ten or twelve miles long, and the passage presents the same variety of immense, close, towering, rocky walls, broken apart by the full roaring stream, common to all the Wasatch canons. Power of resistance on the one hand, and of attack on the other, are well symbolized. There are minerals and mineral springs along the way. Through the outlying range one enters Ogden Valley, an enclosed park, with its settlements and farms, beyond which the drive extends into both Bear Lake and Cache Valleys. All the streams in that part of the Territory afford good sport for the angler, and the valleys and hills are grass grown and alive with grouse and snipe, sage hens and prairie chickens.

From Salt Lake City, Parley's Park, Big Cottonwood Lake, and American Fork Canons are the favorite resorts. The park is about twenty-five miles from Salt Lake City, just over the crest of the Wasatch, on the sources of the Weber, and nearly as high as the mountains themselves. The road ascends through Parley's Canon, and is a fine drive. There is a hotel in the park, but visitors usually prefer taking along with their team their own camping outfit. The elevation ensures refreshing coolness, especially of the nights. The park is quite extensive in area, affording good drives, fishing and hunting, and stretches for horseback riding, and among other objects of interest, Park City and the Ontario mill and mine. One can get a fair idea of the ways and means of mining by a visit to this town, mine, and mining district. Excursions may be made eastward to the sources of the Weber and Provo Rivers, the whole region being full of interest. It is an old formation, apparently, giving evidence of the mighty action of water or ice, or both, geological ages ago.

There are a series of small lakes at the head of Big Cottonwood, at the most picturesque of which, namely Mary's, Mr. Brighton has built a hotel for the accommodation of summer visitors. For many years it has been a famous mountain resort, and the number of persons seeking its cool, fresh air, and the enjoyment to be derived from a study of nature in its grandest aspects, is yearly increasing. The hotel is always full during the hot months, and the lake bordered all around with the tents and wagons of campers. Excursions must be made on foot or horseback. They may include visits to Park City, Heber City, Midway, or Kamas; to the Big and Little Cottonwood mines, to other rock-bound tarns, and to sightly peaks. From one of these one can look out over Jordan Valley, the lower section of the Oquirrh, Rush Valley, and in clear weather, upon the far summits of the Deep Creek Mountains, glittering like silver points in the dim distance. Perhaps the finest view is from Bald Peak, among the highest of the range. Standing on its top, 20,000 square miles of mountains, gorge, lake, and valley, may be swept by the eye. Eighty miles south, Mount Nebo bounds the view. Beneath lies Utah Lake, a clear mirror bordered by gray slopes, and Salt Lake City, embowered in foliage, with Great Salt Lake rolling its white caps and glittering in the sunshine beyond, its islands and all the valley ranges dwarfed to hills. Northward the higher points of the Wasatch catch the eye until they are lost in the distance. Eastward the sources of the Weber and Provo fill the foreground, while successive mountain ranges bound the view in that direction. Words can give but a faint idea of the magnificence of the outlook from Bald Peak, or Kesler's Peak, or Mount Clayton, the corner of three counties, and from whose bare sides start Snake Creek, the Cottonwoods, and American Fork, or any other of the higher summits in the vicinity of Mary's Lake.

South of the Cottonwoods, American Fork Canon opens into the Utah Lake Basin. It has been called the Yosemite of Utah, and undoubtedly its succession of wild gorges and timbered vales makes it the most picturesque and interesting of any of the canons of the Wasatch. Formerly a narrow gague railroad, intersecting the Utah Central at the village of American Fork, thirty-two miles south of Salt Lake City, enabled the visitor to see part of it with but little trouble. The road was unprofitable and was therefore taken up in 1878 and laid down in Spanish Fork Canon, farther south. To visit it now one must take horse or carriage at American Fork, and the better way will be to take along a complete outfit for camping, although there are buildings at Deer Creek and at Forest City. The railroad never extended farther than Deer Creek, twelve miles. Here one takes horses, eight miles to Forest City, and then the ascent to the Miller mine, or the Silver Bell, begins. It is four miles farther, the mines being 11,000 feet in altitude. Once there, it is but a short climb to the top of the peak, nearly as high as any of the Range, and affording a most magnificent and almost unbounded view in fine weather.

This canon is noted not only for the towering altitude of its enclosing walls, but for the picturesqueness of the infinite shapes, resembling artificial objects, towers, pinnacles, and minarets chiefly, into which the elements have worn them. At first the formation is granite and the cliffs rise to a lofty height almost vertically. Then come quartzite or rocks of looser texture, conglomerates and sandstones, the canon opens to the sky and you enter a long gallery, the sides of which recede at an angle of 45 degrees to a dizzy height, profusely set with these elemental sculptures in endless variety of size and pattern, often stained with rich colors. "Towers, battlements, shattered castles, and the images of mighty sentinels," says one, "exhibit their outlines against the sky. Rocks twisted, gnarled, and distorted; here a mass like the skeleton of some colossal tree which lightning had wrenched and burnt to fixed cinder; there another, vast and overhanging, apparently crumbling and threatening to fall and ruin." At Deer Creek the canon proper ceases, the road has climbed out of it, 2,500 feet in eight miles. This is the main resort of pleasure parties. Since the railroad was taken up, its bed has become a wagon road, which continues to Forest City, eight miles above. The surroundings are still mountainous, but there are breaks where the brooks come in, of grassy hills, and forests of aspen and pine. Forest City has been a great charcoaling station for many years.

To the sublimity of the canon scenery in summer an indescribable beauty is added in the autumn, when the deciduous trees and shrubbery on a thousand slopes, touched by the frost, present the colors of a rich painting and meet the eye wherever it rests. To get the full benefit of this, one must go up and up till there is nothing higher to climb. In winter another and very different phase succeeds. The snows, descending for days and days in blinding clouds, bury the forests and fill the canon. Accumulating to a great depth on high and steep acclivities, it starts without warning and buries in ruin whatever may be in its track. Hardly a year passes that miners and teamsters, wagons and cabins are not swept away and buried out of sight for months. The avalanche of the Wasatch is as formidable as that of the Alps. Probably forty feet of snow falls on the main Range every winter. Seven miles of tramway in Little Cottonwood Canon are closely and strongly shedded for defense against snow-slides. Even this is not always effectual. Yet the main traveled roads over this Range, whether wagons or railroads, are but little obstructed by snow as a general thing.

Utah Basin has been treated as a part of Salt Lake Basin, but it is shut off by a low range cut through by the Jordan River and run through by the Utah Central Railroad. Its prettiest feature is a sheet of sweet water thirty miles in length and about ten in breadth, with broad grassy slopes from the water's edge to the foot of enclosing mountains. It receives the American, Provo, and Spanish rivers, and discharges into Great Salt Lake through the Jordan River. It abounds in fish, principally speckled trout, of large size and good flavor. This made it a noted resort of the Utah Indians in former days, after whom the lake, the county and the Territory seem to have been named. It is a pity the other Indian names of springs and creeks in this pretty basin have not been likewise preserved—Timpanogas, Pomontquint, Waketeke, Pinquan, Pequinnetta, Petenete, Pungun, Watage, Onapah, Timpa, Mouna, and so on. They have all been superseded and their memory is fast passing away as the Indians themselves have done.

"On the Timpanogas (Provo) bottoms," said Lieutenant Gunnison, thirty years ago, "wheat grows most luxuriantly, and the root crops are seldom excelled. A continuous field can be made thence to the Waketeke (Summit) Creek, and the lovely Utah Valley made to sustain a population of more than 100,000 inhabitants. The field was long since made, and the population now numbers 15,000. The town is Provo, on the Timpanogas, under the overshadowing Wasatch. It is like all the better class of towns in Utah, regularly laid out, and an accumulation of garden spots, every house half hidden by the foliage of fruit trees and vines. Provo is about fifty miles by the Utah Central Railway, south of Salt Lake City, and is a good outfitting point for the tourist. The principal attractions in the vicinity are Utah Lake and Provo River. The latter has the inevitable canon, above which a fine carriage road leads through a succession of settled Alpine valleys to Kamas Prairie, which Captain Stansbury describes as "a most lovely, fertile, level prairie, ten or twelve miles long and six or seven miles wide," where the affluents of the Provo and Weber interlock. The drive may proceed down the Weber to Ogden if one desire, with the same alternation of land-locked valleys and mountain gorges. A dozen thriving settlements will have been passed through en route.

Six miles south of Provo is Springville, where the Denver & Rio Grande Western Railroad may be taken up Spanish Fork into the finest timbered, tallest grassed, best watered section of Utah, presenting a fresh field for hunting and fishing. All along here the Wasatch Range presents a most interesting aspect, and frequently offers access via canons of more or less attractiveness. An isolated range trending north and south, west of the lake, divides the basin into separate halves, cutting off Cedar and Goshen valleys, dry for the most part and of little account, sloping gradually up for twenty miles to the summit of the Oquirrh, 6,000 feet high, on the western side of which are the Tintic mines.

Utah Lake Basin may be said to end in the vicinity of Nephi, under Mount Nebo, where Onapah (Salt Creek) Canon opens the way for another side railroad into Sanpete Valley, with its eight or ten settlements and 10,000 to 12,000 inhabitants. From the head of Sanpete one may find his way northward into Spanish Fork, or eastward over a mountain into Thistle or Castle valleys. Southward the valley opens on the Sevier River, a world in itself, with passes of the most majestic grandeur through ranges on either hand into adjoining valleys. A journey up the Sevier in fine weather is very interesting, and so is the region about its heads, where the waters divide and flow apart. The town of Kanarra marks the very crest of the rim, the waters flowing from the village north and south. The character of the Colorado scenery is well known. It is a high sandstone plateau, cut by the river and side streams a mile in depth, too dry for animal or vegetable life, and worthless for the most part, unless for minerals. The river is hardly navigable above Fort Yuma. The scenery is described as more terrible than beautiful, and traveling through the country is difficult if not dangerous.

The physical features of Utah, mountain and desert and salt sea, are peculiar and of perennial interest. The Territory has all the resources of an empire within itself. Its climate is healthful and agreeable. It is in the

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